SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN, that we, John S. Hendricks and Alfred E. Bonner, citizens of the United States and residents of Montgomery County, Maryland, have invented certain new and useful improvements in

METHOD AND APPARATUS FOR SWITCHING TARGETED ADVERTISEMENTS AT A SET TOP TERMINAL of which the following is a specification.

1 **METHOD AND APPARATUS FOR SWITCHING TARGETED**
2 **ADVERTISEMENTS AT A SET TOP TERMINAL**

3 **CROSS REFERENCE TO RELATED APPLICATIONS:**

4   This application is a divisional of application Ser. No. 08/735,549 filed October
5 23, 1996, entitled "Method And Apparatus For Targeted Advertising" (As Amended),
6 which is a divisional of application Ser. No. 08/160,280, filed December 2, 1993, now
7 issued Patent No. 5,600,364, entitled "Network Controller for Cable Television Delivery
8 Systems", which is a continuation-in-part of application Ser. No. 07/991,074 filed
9 December 9, 1992, entitled "Television Program Packaging And Delivery System With
10 Menu Driven Subscriber Access", all of which are herein incorporated by reference. The
11 following other continuation-in-part applications are also incorporated herein by
12 reference:

13   Ser. No. 08/160,281, filed December 2, 1993, now issued Patent No. 5,798,785,
14   entitled "Reprogrammable Terminal For Suggesting Programs Offered On A
15   Television Program Delivery System;"

16   Ser. No. 08/160,282, filed December 2, 1993, now issued Patent No. 5,659,350,
17   entitled "An Operations Center For A Television Program Packaging And Delivery
18   System;"

19   Ser. No. 08/160,193, filed December 2, 1993, now issued Patent No. 5,734,853,
20   entitled "Set Top Terminal For Cable Television Delivery Systems;"

21   Ser. No. 08/160,194, filed December 2, 1993, now issued Patent No. 5,990,927,
22   entitled "Advanced Set Top Terminal For Cable Television Delivery Systems;"

23   Ser. No. 08/160,283, now issued Patent No. 5,682,195, entitled "Digital Cable
24   Headend For Cable Television Delivery System."

25 **TECHNICAL FIELD**

26   The invention relates to television entertainment systems for providing television
27 programming to consumer homes. More particularly, the invention relates to a network
28 controller that monitors, controls and manages a television program delivery network
29 from a cable headend.

1 **BACKGROUND OF THE INVENTION**

2   Advances in television entertainment have been primarily driven by

3 breakthroughs in technology. In 1939, advances on Vladmir Zworykin's picture tube

4 provided the stimulus for NBC to begin its first regular broadcasts. In 1975, advances in

5 satellite technology provided consumers with increased programming to homes.

6   Many of these technology breakthroughs have produced inconvenient systems for

7 consumers. One example is the ubiquitous three remote control home, having a separate

8 and unique remote control for the TV, cable box and VCR. More recently, technology

9 has provided cable users in certain parts of the country with 100 channels of

10 programming. This increased program capacity is beyond the ability of many consumers

11 to use effectively. No method of managing the program choices has been provided to

12 consumers.

13   Consumers are demanding that future advances in television entertainment,

14 particularly programs and program choices, be presented to the consumer in a user

15 friendly manner. Consumer preferences, instead of technological breakthroughs, will

16 drive the television entertainment market for at least the next 20 years. As computer

17 vendors have experienced a switch from marketing new technology in computer hardware

18 to marketing better useability, interfaces and service, the television entertainment industry

19 will also experience a switch from new technology driving the market to consumer

20 useability driving the market.

21   Consumers want products incorporating new technology that are useful, and will

22 no longer purchase new technology for the sake of novelty or status. Technological

23 advances in sophisticated hardware are beginning to surpass the capability of the average

24 consumer to use the new technology. Careful engineering must be done to make

25 entertainment products incorporating new technology useful and desired by consumers.

26   In order for new television entertainment products to be successful, the products

27 must satisfy consumer demands. TV consumers wish to go from limited viewing choices

28 to a variety of choices, from no control of programming to complete control. Consumers

29 wish to advance from cumbersome and inconvenient television to easy and convenient

30 television and keep costs down. Consumers do not wish to pay for one hundred channels

31 when due to lack of programming information, they seldom, if ever, watch programming

1 on many of these channels. Viewers wish their programming to be customized and
2 targeted to their needs and tastes.

3 The concepts of interactive television, high definition television and 300 channel
4 cable systems in consumer homes will not sell if they are not packaged, delivered and
5 presented in a useable fashion to consumers. Consumers are already being bombarded
6 with programming options, numerous "free" cable channels, subscription cable channels
7 and pay-per-view choices. Any further increase in TV entertainment choices, without a
8 user friendly presentation and approach, will likely bewilder viewers with a mind-
9 numbing array of choices.

10 The TV industry has traditionally marketed and sold its programs to consumers in
11 bulk, such as continuous feed broadcast and long-term subscriptions to movie channels.
12 The TV industry is unable to sell its programming in large quantities on a unit per unit
13 basis, such as the ordering of one program. Consumers prefer a unit sales approach
14 because it keeps costs down and allows the consumer to be more selective in their
15 viewing.

16 In today's television world, networks manage the program lineup for individual
17 channels. Each network analyzes ratings for television shows and determines the
18 appropriate schedule or program lineup to gain market share and revenue from
19 advertising. Program ratings are determined using a test group of viewers and statistical
20 analysis methods. Since each channel is in competition with every other channel, there is
21 no coordinated effort to organize television programming in a manner that primarily suits
22 the viewers.

23 Advertising has become equally annoying, with viewers being "forced" to watch
24 television commercials for goods and services that are neither needed nor desired. As a
25 result, consumers have become impatient and dissatisfied with today's television delivery
26 systems. Equally problematic, these television delivery systems do not have the
27 capabilities or features necessary to operate in the digital environment. Consequently,
28 advances in digital technology call for a new television program delivery system that is
29 capable of satisfying varying consumer and viewer needs.

30 Existing cable headends are unequipped for the transition to a digital system.
31 These cable headends have no means for monitoring and controlling the large numbers of
32 program signals and advertisements that will eventually be passed on to both consumers

1   and viewers. These cable headends are unequipped to manage account and billing

2   information for set top terminals without relying on telephone lines. In addition, these

3   cable headends have no means for targeting advertisements to particular consumers and

4   viewers.

5   What is needed is a network controller capable of modifying program control

6   information received from an external source.

7   What is needed is a network controller capable of targeting video to viewers.

8   What is needed is a network controller capable of targeting television

9   commercials to specific consumers and viewers.

10   What is needed is a network controller capable of gathering information on

11   programs watched by viewers.

12   The present invention is addressed to fulfill these needs.

13

14   **SUMMARY OF INVENTION**

15   A system and method for switching targeted advertisements is described herein.

16   In one embodiment one primary advertisement is assigned to a first channel, where the

17   first channel carries a program. At least one alternate advertisement is assigned to one or

18   more alternate channels. Selected set top terminals switch to one or more of the alternate

19   channels to display alternate advertisements, where the selection of the alternate channel

20   is based on information related to users of the set top terminals.

21   The present invention utilizes a network controller for a television delivery

22   system. The network controller is the central component that provides monitoring and

23   control of set top terminals in a television delivery system. The network controller is a

24   component of a digital cable television delivery system. The network controller of the

25   present invention provides much greater capability and flexibility than existing cable

26   headend control equipment.

27   The network controller of the preferred embodiment performs all its cable

28   network monitoring and control of set top terminals within the cable headend. The cable

29   headend receives and processes digitally compressed program signals before the signals

30   are relayed to each set top terminal. Each cable headend site is equipped with multiple

31   satellite receiver dishes and a signal processor.

1   As an intermediary between the set top terminals and the program delivery

2 system's operations center (or other remote site), the cable headend relies on the network

3 controller to perform key cable system operations. In particular, the network controller

4 accommodates regional programming needs by working with other cable headend

5 components. The network controller also performs the system control functions for the

6 cable system.

7   The primary function of the network controller is to manage the configuration of

8 set top terminals and process signals received from the set top terminals. In the preferred

9 embodiment, the network controller monitors, among other things, automatic poll-back

10 responses from the set top terminals remotely located at each subscribers' home. The

11 polling and automatic report-back cycle occurs frequently enough to allow the network

12 controller to maintain accurate account and billing information as well as monitor

13 authorized channel access.

14   In the simplest embodiment, information to be sent to the network controller will

15 be stored in RAM within each subscriber's set top terminal and will be retrieved only

16 upon polling by the network controller. Retrieval may, for example, occur on a daily,

17 weekly or monthly basis. The network controller allows the system to maintain complete

18 information on all programs watched using a particular set top terminal.

19   The network controller is also able to respond to the immediate needs of a set top

20 terminal, or a group of set top terminals. The network controller can modify a program

21 signal received from the program delivery system's operations center before the program

22 signal is transmitted to the set top terminal. Therefore, the network controller enables the

23 delivery system to adapt to the specific requirements of individual set top terminals when

24 information on these requirements cannot be provided to the operations center in advance.

25 In other words, the network controller is able to perform "on the fly programming"

26 changes. With this capability, the network controller can handle sophisticated local

27 programming needs such as interactive television services, split screen video, and

28 selection of different foreign languages for the same video. In addition, the network

29 controller controls and monitors all compressors and decompressors in the system.

30   The network controller makes use of a number of software routines that assist the

31 network controller to perform its major functions. One of the major routines assists the

32 network controller to modify the program control information so that changes and

1   additions in programming and advertisements can be accommodated. Such changes and

2   additions include set top terminal access authorizations and deauthorizations.

3   A set top terminal data gathering routine allows the network controller to schedule

4   and perform polling of all set top terminals operating in the system. The software also

5   provides the network controller with a means of processing status reports received from

6   set top terminals in response to polling requests.

7   A video targeting routine makes use of a viewer's demographic information and

8   viewing habits to determine those advertisements that are of most interest to that

9   particular viewer. In so doing, the routine generates packages of advertisements targeted

10   towards each viewer.

11   An additional routine correlates the programs accessed with pricing information

12   to generate billing reports that can be sent to a given set top terminal over the cable

13   distribution network. Aside from this routine, the network controller accommodates other

14   methods of billing and account maintenance, such as through the use of remote billing

15   sites.

16   The present invention is not only able to operate in the digital environment but

17   also introduces many new features to television program delivery and cable headend

18   control.

19   The present invention provides for several methods for targeting advertising to at

20   least one subscriber. In one embodiment, programs watched data are gathered from a

21   subscriber and then the programs watched data is analyzed to determine the frequency of

22   programs watched by the subscriber. The analyzed programs watched data are correlated

23   with categories of advertisements, such that each advertisement category includes at least

24   one advertisement. An advertisement is then selected from the correlated categories and

25   transmitted for display to the subscriber.

26   These and other objects and advantages of the invention will become obvious to

27   those skilled in the art upon review of the following description, the attached drawings

28   and appended claims.

29

30   **DESCRIPTION OF THE DRAWINGS**

31   Figure 1 is a diagram of the primary components of the television delivery system.

1   Figure 2 is an overview of the television delivery system operations.

2   Figure 2A is a schematic of a marketing information interface.

3   Figure 3 is a schematic of the operation of the primary components of the system.

4   Figure 4 is a diagram of the primary components of the cable headend.

5   Figure 5 is a diagram of the cable headend showing the primary components of
6   the network controller.

7   Figure 6a is a schematic of a basic cable headend having network controller
8   components.

9   Figure 6b is a schematic of an alternative embodiment of Figure 6a.

10   Figure 7 is a detailed diagram of the components of the cable headend.

11   Figure 8a is a drawing of a broadcast television menu screen to be displayed on a
12   set top terminal.

13   Figure 8b is a drawing of a hit movie menu screen to be displayed on a set top
14   terminal.

15   Figure 8c is a drawing of a hit movie description menu screen to be displayed on a
16   set top terminal.

17   Figure 9a is a diagram for out-of-band two-way data transmission for a
18   digital/analog headend.

19   Figure 9b is a diagram for in-band two-way data transmission for a digital/analog
20   headend.

21   Figure 10a is a diagram of the polling request message format.

22   Figure 10b is a diagram of the polling response message format with an expanded
23   view of the programs accessed block field.

24   Figure 11 is a diagram of the network controller CPU and its relational
25   components.

26   Figure 12 is diagram of the network control database structure.

27   Figure 13 is a diagram of the relationship between the major software routines.

1   Figure 14 is a block diagram of the software flow chart for the Modifying PCI

2   routine.

3   Figure 15 is a block diagram of the software flow chart for the Polling Cycle

4   routine.

5   Figure 16 is a diagram of a sample programs watched matrix.

6   Figure 17 is a block diagram of the software flow chart for the Basic

7   Advertisement Targeting routine.

8   Figure 18 is a block diagram of the subroutine flow chart for processing programs

9   watched matrices through correlation algorithms.

10   Figure 19 is a diagram of the subroutine flow chart for determining final

11   groupings of set top terminals.

12   Figure 20a is a diagram showing a sample assignment of advertising channels to

13   set top terminal groups watching particular categories of programs.

14   Figure 20b is a diagram assigning available bandwidth for multiple advertising

15   channels.

16   Figure 21 is a diagram of the software flow chart for an alternative to the Basic

17   Advertisement Targeting routine.

18   Figure 22 is a diagram of the software flow chart for the Account/Billing routine.

19   Figure 23 is a diagram of an embodiment that uses remote statistical and billing

20   sites.

21   Figure 24a is a schematic of a set top terminal.

22   Figure 24b is another schematic of a set top terminal.

23   Figure 24c is yet another schematic of a set top terminal.

24   Figure 24d is still another schematic of a set top terminal.

25   Figure 25 is a flow chart of the progression of primary menus in the menu driven

26   system of the set top terminal.

27   Figure 26 is a drawing of basic menus according to an embodiment of the

28   invention.

29   Figures 27a and 27b are drawings of introductory menus.

9

1   Figures 28a, 28b, 28c and 28d are drawings of home menus.

2   Figure 29 is a drawing of an alternative home menu.

3   Figures 30a, 30b, 30c, 30d, 30e, 30f and 30g are drawings of major menus.

4   Figure 31 is a drawing of hit movie description menu.

5   Figures 32a and 32b are drawings of hit movie notification submenus.

6   Figures 33a and 33b are drawings of menus related to promotion of high

7   definition television programming.

8   Figures 34a, 34b, and 34c are drawings of interactive television promotional

9   menus, for Levels A-C.

10   Figures 35a, 35b, 35c, 35d, and 35e are drawings of submenus for interactive

11   television services, Level A.

12   Figures 36a, 36b, 36c, 36d, and 36e are drawings of on-line service menus.

13   Figures 37a, 37b, and 37c are drawings of menus for digital audio services.

14

15   **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

16   A.   <u>Television Program Delivery System Description</u>

17   1.   <u>Introduction</u>

18   Figure 1 shows the present invention as part of an expanded cable television

19   program delivery system 200 that dramatically increases programming capacity using

20   compressed transmission of television program signals. Developments in digital

21   bandwidth compression technology now allow much greater throughput of television

22   program signals over existing or slightly modified transmission media. The program

23   delivery system 200 shown provides subscribers with a user friendly interface to operate

24   and exploit a six-fold or more increase in current program delivery capability.

25   Subscribers are able to access an expanded television program package and view

26   selected programs through a menu-driven access scheme that allows each subscriber to

27   select individual programs by sequencing a series of menus. The menus are sequenced by

28   the subscriber using simple alpha-numeric and iconic character access or moving a cursor

29   or highlight bar on the TV screen to access desired programs by simply pressing a single

1   button, rather than recalling from memory and pressing the actual two or more digit

2   numeric number assigned to a selection. Thus, with the press of a single button, the

3   subscriber can advance from one menu to the next. In this fashion, the subscriber can

4   sequence the menus and select a program from any given menu. The programs are

5   grouped by category so that similar program offerings are found on the same menu.

6   ## 2.   Major System Components

7   In its most basic form, the system uses a program delivery system 200 in

8   conjunction with a conventional concatenated cable television system 210. The program

9   delivery system 200 generally includes (i) at least one operations center 202, where

10   program packaging and control information are created and then assembled in the form of

11   digital data, (ii) a digital compression system, where the digital data is compressed,

12   combined/multiplexed, encoded, and mapped into digital signals for satellite transmission

13   to the cable headend 208, and (iii) a set of in-home decompressors. The program delivery

14   system 200 transports the digital signals to the cable headend 208 where the signals are

15   transmitted through a concatenated cable television system 210. Within the cable

16   headend 208, the received signals may be decoded, demultiplexed, managed by a local

17   central distribution and switching mechanism, combined and then transmitted to the set

18   top terminal 220 located in each subscriber's home over the cable system 210. Although

19   concatenated cable systems 210 are the most prevalent transmission media to the home,

20   telephone lines, cellular networks, fiberoptics, Personal Communication Networks and

21   similar technology for transmitting to the home can be used interchangeably with this

22   program delivery system 200.

23   The delivery system 200 has a reception region 207 with an in-home

24   decompression capability. This capability is performed by a decompressor housed within

25   a set top terminal 220 in each subscriber's home. The decompressor remains transparent

26   from the subscriber's point of view and allows any of the compressed signals to be

27   demultiplexed and individually extracted from the composite data stream and then

28   individually decompressed upon selection by the subscriber. The decompressed video

29   signals are converted into analog signals for television display. Such analog signals

30   include NTSC formatted signals for use by a standard television. Control signals are

31   likewise extracted and decompressed and then either executed immediately or placed in

32   local storage such as a RAM. Multiple sets of decompression hardware may be used to

33   decompress video and control signals. The set top terminal 220 may then overlay or

1   combine different signals to form the desired display on the subscriber's television.

2   Graphics on video or picture-on-picture are examples of such a display.

3   Although a single digital compression standard (e.g., MPEG) may be used for

4   both the program delivery system 200 and the concatenated cable system 210, the

5   compression technique used may differ between the two systems. When the compression

6   standards differ between the two media, the signals received by the cable headend 208

7   must be decompressed before transmission from the headend 208 to the set top terminals

8   220. Subsequently, the cable headend 208 must recompress and transmit the signals to

9   the set top terminal 220, which would then decompress the signals using a specific

10   decompression algorithm.

11   The video signals and program control signals received by the set top terminal 220

12   correspond to specific television programs and menu selections that each subscriber may

13   access through a subscriber interface. The subscriber interface is a device with buttons

14   located on the set top terminal 220 or on a portable remote control 900. In the preferred

15   system embodiment, the subscriber interface is a combined alpha-character, numeric and

16   iconic remote control device 900, which provides direct or menu-driven program access.

17   The preferred subscriber interface also contains cursor movement and go buttons as well

18   as alpha, numeric and iconic buttons. This subscriber interface and menu arrangement

19   enables the subscriber to sequence through menus by choosing from among several menu

20   options that are displayed on the television screen. In addition, a user may bypass several

21   menu screens and immediately choose a program by selecting the appropriate alpha-

22   character, numeric or iconic combinations on the subscriber interface. In the preferred

23   embodiment, the set top terminal 220 generates the menus that are displayed on the

24   television by creating arrays of particular menu templates, and the set top terminal 220

25   displays a specific menu or submenu option for each available video signal.

26   **3.**   **Operations Center and Digital Compression System**

27   The operations center 202 performs two primary services, packaging television

28   programs and generating the program control information signal. At the operations center

29   202, television programs are received from external program sources in both analog and

30   digital form. Figure 2 shows an embodiment of the operations center receiving signals

31   from various external sources 212. Examples of the external program sources are

32   sporting events, children's programs, specialty channels, news or any other program

1 source that can provide audio or visual signals. Once the programs are received from the

2 external program sources, the operations center 202 digitizes (and preferably compresses)

3 any program signals received in analog form. The operations center 202 may also

4 maintain an internal storage of programs. The internally stored programs may be in

5 analog or digital form and stored on permanent or volatile memory sources, including

6 magnetic tape or RAM. Subsequent to receiving programming, the operations center 202

7 packages the programs into the groups and categories which provide the optimal

8 marketing of the programs to subscribers. For example, the operations center 202 may

9 package the same programs into different categories and menus for weekday, prime-time

10 viewing and Saturday afternoon viewing. Also, the operations center 202 packages the

11 television programs in a manner that enables both the various menus to easily represent

12 the programs and the subscribers to easily access the programs through the menus.

13   The packaging of the digital signals is typically performed at the operations center

14 202 by computer assisted packaging equipment (CAP). The CAP system normally

15 includes at least one computer monitor, keyboard, mouse, and standard video editing

16 equipment. A programmer packages the signals by entering certain information into the

17 CAP. This information includes the date, time slot, and program category of the various

18 programs. The programmer and the CAP utilize demographic data and ratings in

19 performing the packaging tasks.

20   Extracts of customer purchases will be provided to the Operations Center 202.

21 These extracts of information will be formatted and correlated with customer

22 demographics for marketing purposes by the Marketing Information Interface (MII) 702.

23 The MII 702 is shown in Figure 2a. The Marketing Information Interface (MII) 702

24 subroutine interfaces the processing and editing subroutines with marketing data. This

25 interface regularly receives programs watched information from billing sites 720, cable

26 headends 208, or set top terminals 220. In addition, other marketing information 722

27 such as the demographics of viewers during certain time periods may be received by the

28 MII 702. The MII 702 also uses algorithms 724 to analyze the program watched

29 information and marketing data 720, 722, and provides the analyzed information to the

30 processing and editing subroutines.

31   The process program line-up subroutine 730 uses information from the MII 704

32 and Packager Data Entry Interface (PDEI) 700 to develop a program line-up. Algorithms

33 are used to assign programs in time slots.

1   The operations center 202 may also "insert" directions for filling local available
2   program time in the packaged signal to enable local cable and television companies to fill
3   the program time with local advertising and/or local programming. Consequently, the
4   local cable headends are not constrained to show only programs transmitted from the
5   operations center 202.

6   After the programmer selects the various programs from a pool of available
7   programs and inputs the requisite information, the programmer, with assistance from the
8   CAP, can select the price and allocate transponder space for the various programs. After
9   the process is complete, the CAP displays draft menus or program schedules that
10   correspond to the entries of the programmer. The CAP may also graphically display
11   allocation of transponder space. The programmer may edit the menus and transponder
12   allocation several times until satisfied with the programming schedule. During the
13   editing, the programmer may direct the exact location of any program name on a menu
14   with simple commands to the CAP.

15   The packaging process also accounts for any groupings by satellite transponder
16   which are necessary. The operations center 202 may send different groups of programs to
17   different cable headends 208 and/or set top terminals 220. One way the operations center
18   202 may accomplish this task is to send different program packages to each transponder.
19   Each transponder, or set of transponders, then relays a specific program package to
20   specific cable headends 208 and/or set top terminals 220. The allocation of transponder
21   space is an important task performed by the operations center 202.

22   The operations center 202 may also "insert" directions for filling local available
23   program time in the packaged signal to enable local cable and television companies to fill
24   the program time with local advertising and/or local programming. Consequently, the
25   local cable headends 208 are not constrained to show only programs transmitted from the
26   operations center 202. New set top converters will incorporate both digital and analog
27   channels. Therefore, the cable headend 208 may combine analog signals with the digital
28   signals prior to transmitting the program signals to the set top terminals 220.

29   After the CAP packages the programs, it creates a program control information
30   signal to be delivered with the program package to the cable headend 208 and/or set top
31   terminal 220. The program control information signal contains a description of the

1   contents of the program package, commands to be sent to the cable headend 208 and/or

2   set top terminal 220, and other information relevant to the signal transmission.

3   In addition to packaging the signal, the operations center 202 employs digital

4   compression techniques to increase existing satellite transponder capacity by at least a 4:1

5   ratio, resulting in a four-fold increase in program delivery capability. A number of digital

6   compression algorithms currently exist which can achieve the resultant increase in

7   capacity and improved signal quality desired for the system. The algorithms generally

8   use one or more of three basic digital compression techniques: (1) within-frame

9   (intraframe) compression, (2) frame-to-frame (interframe) compression, and (3) within

10   carrier compression. Specifically, in the preferred embodiment, the MPEG 2

11   compression method is used. After digital compression, the signals are combined

12   (multiplexed) and encoded. The combined signal is subsequently transmitted to various

13   uplink sites 204.

14   There may be a single uplink site 204 or multiple uplink sites (represented by

15   204', shown in phantom in Figure 1) for each operation center 202. The uplink sites 204

16   may either be located in the same geographical place or may be located remotely from the

17   operations center 202. Once the composite signal is transmitted to the uplink sites 204,

18   the signal may be multiplexed with other signals, modulated, upconverted and amplified

19   for transmission over satellite. Multiple cable headends 208 may receive such

20   transmissions.

21   In addition to multiple uplinks, the delivery system 200 may also contain multiple

22   operations centers. The preferred method for using multiple operations centers is to

23   designate one of the operations centers as a master operations center and to designate the

24   remaining operations centers as slave operations centers. In this configuration, the master

25   operations center coordinates various functions among the slave operations centers such

26   as synchronization of simultaneous transmissions and distributes the operations workload

27   efficiently.

28   **4.   Cable Headend**

29   After the operations center 202 has compressed and encoded the program signals

30   and transmitted the signals to the satellite, the cable headend 208 receives and further

31   processes the signals before they are relayed to each set top terminal 220. Each cable

32   headend site is generally equipped with multiple satellite receiver dishes. Each dish is

1   capable of handling multiple transponder signals from a single satellite and sometimes

2   from multiple satellites.

3   As an intermediary between the set top terminals 220 and the operations center

4   202 (or other remote site), the cable headend 208 performs two primary functions. First,

5   the cable headend 208 acts as a distribution center, or signal processor, by relaying the

6   program signal to the set top terminal 220 in each subscriber's home. In addition, the

7   cable headend 208 acts as a network controller 214 by receiving information from each

8   set top terminal 220 and passing such information on to an information gathering site

9   such as the operations center 202.

10   Figure 3 shows an embodiment where the cable headend 208 and the subscriber's

11 home are linked by certain communications media 216. In this particular embodiment,

12 analog signals, digitally compressed signals, other digital signals and up-

13 stream/interactivity signals are sent and received over the media 216. The cable headend

14 208 provides such signaling capabilities in its dual roles as a signal processor 209 and

15 network controller 214.

16   As a signal processor 209, the cable headend 208 prepares the program signals

17 that are received by the cable headend 208 for transmission to each set top terminal 220.

18 In the preferred system, the signal processor 209 re-routes or demultiplexes and

19 recombines the signals and digital information received from the operations center 202

20 and allocates different portions of the signal to different frequency ranges. Cable

21 headends 208 which offer different subscribers different program offerings may allocate

22 the program signals from the operations center 202 in various manners to accommodate

23 different viewers. The signal processor 209 may also incorporate local programming

24 and/or local advertisements into the program signal and forward the revised signal to the

25 set top terminals 220. To accommodate this local programming availability, the signal

26 processor 209 must combine the local signal in digital or analog form with the operations

27 center program signals. If the local cable system uses a compression standard that is

28 different than the one used by the operations center 202, the signal processor 209 must

29 also decompress and recompress incoming signals so they may be properly formatted for

30 transmission to the set top terminals 220. This process becomes less important as

31 standards develop (i.e., MPEG 2). In addition, the signal processor 209 performs any

32 necessary signal decryption and/or encryption.

1   As a network controller 214, the cable headend 208 performs the system control

2   functions for the system. The primary function of the network controller 214 is to

3   manage the configuration of the set top terminals 220 and process signals received from

4   the set top terminals 220. In the preferred embodiment, the network controller 214

5   monitors, among other things, automatic poll-back responses from the set top terminals

6   220 remotely located at each subscribers' home. The polling and automatic report-back

7   cycle occurs frequently enough to allow the network controller 214 to maintain accurate

8   account and billing information as well as monitor authorized channel access. In the

9   simplest embodiment, information to be sent to the network controller 214 will be stored

10   in RAM within each subscriber's set top terminal 220 and will be retrieved only upon

11   polling by the network controller 214. Retrieval may, for example, occur on a daily,

12   weekly or monthly basis. The network controller 214 allows the system to maintain

13   complete information on all programs watched using a particular set top terminal 220.

14   The network controller 214 is also able to respond to the immediate needs of a set

15   top terminal 220 by modifying a program control information signal received from the

16   operations center 202. Therefore, the network controller 214 enables the delivery system

17   to adapt to the specific requirements of individual set top terminals 220 when the

18   requirements cannot be provided to the operations center 202 in advance. In other words,

19   the network controller 214 is able to perform "on the fly programming" changes. With

20   this capability, the network controller 214 can handle sophisticated local programming

21   needs such as, for example, interactive television services, split screen video, and

22   selection of different foreign languages for the same video. In addition, the network

23   controller 214 controls and monitors all compressors and decompressors in the system.

24   The delivery system 200 and digital compression of the preferred embodiment

25   provides a one-way path from the operations center 202 to the cable headend 208. Status

26   and billing information is sent from the set top terminal 220 to the network controller 214

27   at the cable headend 208 and not directly to the operations center 202. Thus, program

28   monitoring and selection control will take place only at the cable headend 208 by the

29   local cable company and its decentralized network controllers 214 (i.e., decentralized

30   relative to the operations center 202, which is central to the program delivery system

31   200). The local cable company will in turn be in communication with the operations

32   center 202 or a regional control center (not shown) which accumulates return data from

33   the set top terminal 220 for statistical or billing purposes. In alternative system

1 embodiments, the operations center 202 and the statistical and billing sites are collocated.

2 Further, telephone lines with modems are used to transfer information from the set top

3 terminal 220 to the statistical and billing sites.

4 ## 5.   Set Top Terminal

5 The set top terminal 220 is the portion of the delivery system 200 that resides in

6 the home of a subscriber. The set top terminal 220 is usually located above or below the

7 subscriber's television, but it may be placed anywhere in or near the subscriber's home as

8 long as it is within the range of the subscriber's remote control device 900. In some

9 aspects, the set top terminal 220 may resemble converter boxes already used by many

10 cable systems. For instance, each set top terminal 220 may include a variety of error

11 detection, decryption, and coding techniques such as anti-taping encoding. However, it

12 will become apparent from the discussion below that the set top terminal 220 is able to

13 perform many functions that an ordinary converter box cannot perform.

14 The set top terminal 220 has a plurality of input and output ports to enable it to

15 communicate with other local and remote devices. The set top terminal 220 has an input

16 port that receives information from the cable headend 208. In addition, the unit has at

17 least two output ports which provide communications from the set top terminal 220 to a

18 television and a VCR. Certain menu selections may cause the set top terminal 220 to

19 send control signals directly to the VCR to automatically program or operate the VCR.

20 Also, the set top terminal 220 contains a phone jack which can be used for maintenance,

21 trouble shooting, reprogramming and additional customer features. The set top terminal

22 220 may also contain stereo/audio output terminals and a satellite dish input port.

23 Functionally, the set top terminal 220 is the last component in the delivery system

24 chain. The set top terminal 220 receives compressed program and control signals from

25 the cable headend 208 (or, in some cases, directly from the operations center 202). After

26 the set top terminal 220 receives the individually compressed program and control

27 signals, the signals are demultiplexed, decompressed, converted to analog signals (if

28 necessary) and either placed in local storage (from which the menu template may be

29 created), executed immediately, or sent directly to the television screen.

30 After processing certain signals received from the cable headend 208, the set top

31 terminal 220 is able to store menu templates for creating menus that are displayed on a

32 subscriber's television by using an array of menu templates. Before a menu can be

1   constructed, menu templates must be created and sent to the set top terminal 220 for

2   storage. A microprocessor uses the control signals received from the operations center

3   202 or cable headend 208 to generate the menu templates for storage. Each menu

4   template may be stored in volatile memory in the set top terminal 220. When the set top

5   terminal receives template information it demultiplexes the program control signals

6   received from the cable headend 208 into four primary parts: video, graphics, program

7   logic and text. Each menu template represents a different portion of a whole menu, such

8   as a menu background, television logo, cursor highlight overlay, or other miscellaneous

9   components needed to build a menu. The menu templates may be deleted or altered using

10   control signals received from the operations center 202 or cable headend 208.

11   Once the menu templates have been stored in memory, the set top terminal 220

12   can generate the appropriate menus. In the preferred embodiment, the basic menu format

13   information is stored in memory located within the set top terminal 220 so that the

14   microprocessor may locally access the information from the set top terminal instead of

15   from an incoming signal. The microprocessor next generates the appropriate menus from

16   the menu templates and the other menu information stored in memory. The set top

17   terminal 220 then displays specific menus on the subscriber's television screen that

18   correspond to the inputs the subscriber selects.

19   If the subscriber selects a specific program from a menu, the set top terminal 220

20   determines on which channel the program is being shown, demultiplexes and extracts the

21   single channel transmitted from the cable headend 208. The set top terminal 220 then

22   decompresses the channel and, if necessary, converts the program signal to an analog

23   NTSC signal to enable the subscriber to view the selected program. The set top terminal

24   220 can be equipped to decompress more than one program signal, but this would

25   unnecessarily add to the cost of the unit since a subscriber will generally only view one

26   program at a time. However, two or three decompressors may be desirable to provide

27   picture-on-picture capability, control signal decompression, enhanced channel switching

28   or like features.

29   In addition to menu information, the set top terminal 220 may also store text

30   transmitted from the cable headend 208 or the operations center 202. The text may

31   inform the subscriber about upcoming events, billing and account status, new

32   subscriptions, or other relevant information. The text will be stored in an appropriate

1   memory location depending on the frequency and the duration of the use of the textual

2   message.

3   Also, optional upgrades are available to enhance the performance of a subscriber's

4   set top terminal 220. These upgrades may consist of a cartridge or computer card (not

5   shown) that is inserted into an expansion slot in the set top terminal 220 or may consist of

6   a feature offered by the cable headend 208 or operations center 202 to which the user may

7   subscribe. Available upgrades may include on line data base services, interactive multi-

8   media services, access to digital radio channels, and other services.

9   In the simplest embodiment, available converter boxes such as those

10   manufactured by General Instruments or Scientific Atlanta, may be modified and

11   upgraded to perform the functions of a set top terminal 220. The preferred upgrade is a

12   circuit card with a microprocessor which is electronically connected to or inserted into the

13   converter box.

14   **6.**   **Remote Control Device**

15   The primary conduit for communication between the subscriber and the set top

16   terminal 220 is through the subscriber interface, preferably a remote control device 900.

17   Through this interface, the subscriber may select desired programming through the

18   system's menu-driven scheme or by directly accessing a specific channel by entering the

19   actual channel number. Using the interface, the subscriber can navigate through a series

20   of informative program selection menus. By using menu-driven, iconic or alpha-

21   character access, the subscriber can access desired programs by simply pressing a single

22   button rather than recalling from memory and pressing the actual channel number to

23   make a selection. The subscriber can access regular broadcast and basic cable television

24   stations by using either the numeric keys on the remote control 900 (pressing the

25   corresponding channel number), or one of the menu icon selection options.

26   In addition to enabling the subscriber to easily interact with the cable system 200,

27   the physical characteristics of the subscriber interface 900 should also add to the user

28   friendliness of the system. The remote control 900 should easily fit in the palm of the

29   user's hand. The buttons of the preferred remote control 900 contain pictorial symbols

30   that are easily identifiable by the subscriber. Also, buttons that perform similar functions

31   may be color coordinated and consist of distinguishing textures to increase the user

32   friendliness of the system.

1   ## 7.   Menu-Driven Program Selection

2   The menu-driven scheme provides the subscriber with one-step access to all major

3   menus, ranging from hit movies to sport specials to specialty programs. From any of the

4   major menus, the subscriber can in turn access submenus and minor menus by cursor or

5   alpha-character access.

6   There are two different types of menus utilized by the preferred embodiment, the

7   Program Selection menus and the During Program menus. The first series of menus,

8   Program Selection menus, consists of an Introductory, a Home, Major menus, and

9   Submenus. The second series of menus, During Program menus, consists of two primary

10   types, Hidden menus and the Program Overlay menus.

11   Immediately after the subscriber turns on the set top terminal 220, the

12   Introductory menu welcomes the subscriber to the system. The Introductory menu may

13   display important announcements from the local cable franchise, advertisements from the

14   cable provider, or other types of messages. In addition, the Introductory menu can inform

15   the subscriber if the cable headend 208 has sent a personal message to the subscriber's

16   particular set top terminal 220.

17   After the Introductory menu has been displayed the subscriber may advance to the

18   next level of menus, namely the Home menu. In the preferred embodiment, after a

19   certain period of time, the cable system will advance the subscriber by default to the

20   Home menu. From the Home menu, the subscriber is able to access all of the

21   programming options. The subscriber may either select a program directly by entering

22   the appropriate channel number from the remote control 900, or the subscriber may

23   sequence through incremental levels of menu options starting from the Home menu. The

24   Home menu lists categories that correspond to the first level of menus called Major

25   menus.

26   If the subscriber chooses to sequence through subsequent menus, the subscriber

27   will be forwarded to the Major menu that corresponds to the chosen category from the

28   Home menu. The Major menus further refine a subscriber's search and help guide the

29   subscriber to the selection of his choice.

30   From the Major menus, the subscriber may access several submenus. From each

31   submenu, the subscriber may access other submenus until the subscriber finds a desired

32   television program. Similar to the Major menu, each successive level of Submenus

1   further refines the subscriber's search. The system also enables the subscriber to skip

2   certain menus or submenus and directly access a specific menu or television program by

3   entering the appropriate commands on the remote control 900.

4   The During program menus (including Hidden Menus and Program Overlay

5   Menus) are displayed by the set top terminal 220 only after the subscriber has selected a

6   television program. In order to avoid disturbing the subscriber, the set top terminal 220

7   does not display the Hidden Menus until the subscriber selects the appropriate option to

8   display a Hidden Menu. The Hidden Menus contain options that are relevant to the

9   program selected by the viewer. For example, a Hidden Menu may contain options that

10   enable a subscriber to enter an interactive mode or escape from the selected program.

11   Program Overlay Menus are similar to Hidden Menus because they occur during a

12   program and are related to the program being viewed. However, the Program Overlay

13   Menus are displayed concurrently with the program selected by the subscriber. Most

14   Program Overlay Menus are small enough on the screen to allow the subscriber to

15   continue viewing the selected program comfortably.

16   **B.   Network Controller Description**

17   **1.   Monitoring and Control of Set Top Terminals**

18   Figure 4 shows the network controller 214 of the present invention as part of a

19   digital cable headend 208 operating in an expanded cable television program delivery

20   system, indicated generally at 200. The network controller 214 monitors program

21   selections at subscribers' homes, maintains accurate account and billing information and

22   authorizes both subscriber channel access and particular set top terminals 220 to operate

23   in the system.

24   The network controller 214 performs its monitoring and control capability by

25   working with other system components housed, in part, within the cable headend 208.

26   These cable headend components include a cable headend receiver 203 and a signal

27   processor 209. As shown in the Figure 4, digital RF program signals 205 are received

28   and processed for further distribution to a subscriber's home through a set top terminal

29   220. The program signals 205 are digitally compressed and multiplexed signals that may

30   be processed at the cable headend 208 or simply passed through to the cable distribution

31   network. In the embodiment shown in Figure 4, the program signals 205 are received by

32   the cable headend receiver 203 and transmitted to the signal processor 209.

1   The signal processor 209 prepares the program signals 205 that are received by

2   the cable headend 208 for transmission to each set top terminal 220. In the preferred

3   system, the network controller 214 supervises and, in some cases, instructs the signal

4   processor 209 in routing the signals to subscribers. In this way, the network controller

5   214 and signal processor 209 work with one another to perform basic control functions in

6   the cable television system 200. Typically, this work is accomplished by the transfer of

7   control information, represented at 211, between the network controller 214 and the

8   signal processor 209.

9   Although it is preferred that the signal processor 209 and network controller 214

10   be co-located at the cable headend 208, the network controller 214 may be remotely

11   located from the cable headend 208, as long as it remains in communication with the

12   signal processor 209 in order to exchange control information 211.

13   In many instances, the program signals 205 received from the operations center

14   202 must be modified prior to being sent to the set top terminals 220. These

15   modifications to the program control information 211 are made by the network controller

16   214 working in conjunction with the signal processor 209 to send a set top terminal

17   control information stream (STTCIS). From the signal processor 209, the network

18   controller 214 receives the program signals 205, which include cable franchise specific

19   information added by the operations center 202. The network controller 214 modifies the

20   program signals 205, if necessary, and communicates the new information back to the

21   signal processor 209. The signal processor 209 then forwards the information to the set

22   top terminal 220 in the form of the STTCIS, arrow 215. In most instances, the network

23   controller 214 will modify the program signals 205 by adding additional information;

24   however, the program signals 205 can be passed through the cable headend 208 to the set

25   top terminal 220 without any modification.

26   The signal processor 209 and network controller 214 are both capable of handling

27   the addition of simple local availabilities (e.g., local advertisements) into the signal sent

28   to the set top terminal 220. The network controller 214 is also capable of handling more

29   sophisticated local programming needs such as targeting video commercials,

30   infomercials, interactive programming and certain data services. The network controller

31   214 receives all electronic signals sent by the set top terminal 220, including those sent in

32   response to interactive service requests and some data service requests. The network

1 controller 214 coordinates the necessary switching and access to allow the subscriber to

2 enjoy these services.

3   The network controller 214 has the capability of performing "on the fly

4 programming" changes, assisting in (i) masking portions of subscriber's television

5 screens (split screen video), (ii) selecting different audio signals for the same video

6 (foreign languages), and (iii) interactive features. In addition, the network controller can

7 create programming changes. For last minute changes to programming (such as for a

8 local emergency or important regional events), an operator using the network controller

9 214 can modify the program signals 209 "on the fly" and change menus available to the

10 subscriber. This accommodates short notice changes to program packaging that cannot

11 be handled by the operations center 202 in advance.

12   In order to accommodate split screen techniques for promo and demo video

13 (which will be described later), undesired video portions of the television or menu screen

14 may be masked. The network controller 214 can send the necessary control information

15 to inform the set top terminal 220 to mask portions of a specific channel's video. For

16 example, a video channel with a split screen showing four separate videos would require

17 a three-fourths mask to focus the viewer on the featured video clip.

18   Tiered programming allows different users to view different video even though

19 they are "tuned" to the same channel. For example, the network controller 214 may know

20 the demographics of its subscribers through a database generated, in part, from prior

21 subscriber choices, an interactive selection, or other means. Using the demographics

22 information, the network controller 214 may target commercials to the correct audience

23 by showing different commercials to subscriber's with different demographics.

24 Information on programs watched may also be used to target commercials. Even though

25 subscribers will believe they are "tuned" to one channel, they will be switched to a

26 different channel for the tiered video and targeted commercial. Alternatively, individual

27 subscribers may be offered a menu with the option of several commercials from which to

28 choose.

29   To accommodate foreign speaking subscribers, multiple audio channels for

30 television programming may be provided. The subscriber may be shown menus of

31 programs available in the subscriber's native language. The function of choosing the

32 correct audio to correspond to the selected language may be handled by either the set top

1   terminal 220 or the network controller 214 depending upon the configuration. Local

2   programming in several languages or additional audio channels for a foreign language

3   translation of a popular television program may be provided by the network controller

4   214. Using a picture-on-picture feature, sign language may be similarly made available

5   to certain set top terminals 220 for the deaf. The sign language video may be transmitted

6   to the set top terminal 220 on a separate channel. Also, a text overlay for the deaf may be

7   easily produced on the lower part of the screen. The control signals for producing the text

8   overlay may be handled by the network controller 214.

9   In other embodiments, the network controller 214 can act as a central computer

10   and provide intra-set top terminal interactive games, inter-set top terminal interactive

11   games, computer bulletin board type services, message services (Electronic mail), etc.

12   For example, a subscriber may play war games with six of his (anonymous) fellow

13   subscribers each in their own home each operating a separate tank. The network

14   controller 214 gathers the players using set top terminal 220 communications and acts as

15   the referee. The network controller software "plays" the game and generates the video

16   control signals to be transmitted to the set top terminals 220. From the video control

17   signals, the set top terminal generates a view of the playing field and shows movement of

18   the tanks. Using a similar method, a bulletin board or message system can be set up to

19   discuss a particular program such as "Twin Peaks Whodunit" for enthusiasts with set top

20   terminals 220.

21   ### 2.   Monitoring and Control of Cable Headend Signal Processor

22   Figure 5 shows the network controller's major components and how these

23   components relate with other components of the cable system 200. The network

24   controller's internal components include a network controller CPU 224, databases 226,

25   control receiver 228, local memory 230 and telephone modem 232. The network

26   controller's CPU 224 and databases 226 may be accessed through an operator control

27   station, which may include peripherals such as a computer workstation, CRT display, and

28   printer, represented by the workstation 234.

29   Information required to operate the network controller 214 will be stored in

30   databases 226 and local memory 230 (e.g., either in RAM, ROM, or magnetic or optical

31   Read/Write devices) at the cable headend 208 as well as in memory (RAM and/or ROM)

32   within each subscriber's set top terminal 220. In the preferred embodiment, two-way

1 communications between the network controller 214 and set top terminal 220 will occur

2 over cable lines. Many other methods of communication, including those which do not

3 require cables or wires, may be used with the present invention. Using two-way

4 communication, interactive television programming can be accommodated through the

5 network controller 214. In addition, the preferred network controller 214 will be able to

6 access set top terminals 220 via phone lines for trouble shooting, special features or

7 sophisticated reprogramming.

8 The network controller CPU 224 controls the interface, depicted at 211, between

9 the network controller 214 and the signal processor 209. This interface 211 allows

10 control information to flow or transfer between the two cable headend 208 components.

11 Standard RS-232 or RS-422 links, an IEEE-488 bus or other interface media may be used.

12 During standard operation, program control information is passed through this interface

13 211 to the network controller CPU 224 from the signal processor 209 (i.e., the program

14 control information having been sent to the signal processor 209 over satellite from the

15 operations center 202 with the RF program signals 205, not shown in Figure 5). The

16 network controller CPU 224 processes the program control information based on data

17 stored in the network control databases. This processing includes modifying the program

18 control information to accommodate regional programming needs.

19 After processing, the network controller CPU 224 passes the program control

20 information, including any modifications, back to the signal processor 209 for

21 distribution over the cable system 200, via the cable distribution network 236. In this

22 fashion, the network controller 214 provides programming and network control

23 instructions to the set top terminals 220 through the signal processor 209.

24 The processing of program control information by the network controller CPU

25 224 can also make use of any data received by the network controller's control receiver

26 228. The control receiver 228 is a microprocessor-based device that receives "status

27 reports" directly from the set top terminals 220. The status reports received by the control

28 receiver 228 generally include information that allows the network controller 214 to

29 track, among other things, a subscriber's program access history, as described below.

30 The control receiver 228 can store the status reports internally in a local storage or

31 memory device and transfer them to the network controller CPU 224. Typically, the

32 control receiver 228 is interfaced with the network controller CPU 224 using standard

33 RS-232 or RS-422 links, an IEEE-488 bus or the like.

1   In the preferred embodiment, the network controller CPU 224 scans the control

2   receiver 228 at a predetermined rate (e.g., once every few seconds) to initiate the status

3   report transfer.   Upon transfer, the network controller CPU 224 adds the data and control

4   information in the status reports to the network control databases 226 by: checking for

5   changes in previously received status information, processing the new information and

6   updating the corresponding parameters in the network control databases 226. The

7   network controller 214 processes the information stored in its databases with any program

8   control information relayed through the signal processor 209 from the delivery system's

9   operations center 202. This processing capability allows the network controller 214 to

10   modify prior control signals and create new ones. The network controller 214 transfers

11   both modified and unmodified control signals, along with any local combined program

12   signals 205, to the signal processor 209 to be combined with others program signals 205

13   for distribution over the cable system 200.

14   ### 3.   Modifying the Program Control Information Signal

15   Tables A-C, described below, provide an example of some information that can be

16   sent in the program control information signal to the set top terminals 220. The program

17   control information signal generated by the operations center 202 provides data on the

18   scheduling and description of programs. The program control information signal may be

19   sent through the network controller 214 or, in an alternate configuration, directly to the

20   set top terminal 220 for display to the subscriber. In the preferred embodiment, the

21   program control information signal is stored and modified by the network controller 214

22   and sent to the set top terminal 220 in the form of a set top terminal control information

23   stream (STTCIS). This configuration can accommodate, among other things, differences

24   in individual cable systems and possible differences in set top terminal 220 devices.

25   The set top terminal 220 integrates either the program control signal or the set top

26   terminal control information stream together with data stored in the memory of the set top

27   terminal 220, to generate on-screen menu displays for assisting the subscriber in choosing

28   programs for viewing. (Throughout the description the term "program control

29   information" is being used to indicate control information coming from the cable headend

30   208 to the set top terminal 220, whether it is sent directly from the operations center 202,

31   processed by the network controller 214 and then forwarded to the set top box (STTCIS),

32   or transmitted over telephone lines.)

1   The types of information that can be sent using the program control signal

2   includes: number of program categories, names of program categories, what channels are

3   assigned to a specific category (such as specialty channels), names of channels, names of

4   programs on each channel, program start times, length of programs, description of

5   programs, menu assignment for each program, pricing, whether there is a sample video

6   clip for advertisement for the program, and any other program, menu or product

7   information. In addition, the program control information signal may be used

8   periodically to reprogram or reconfigure a set top terminal 220 or group of set top

9   terminals 220 (described in detail in co-pending patent application Serial No. 08/160,281,

10   now issued Patent No. 5,798,785 entitled, REPROGRAMMABLE TERMINAL FOR

11   SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY

12   SYSTEM, filed by the same assignee incorporated herein by reference).

13   The goal of the menu driven program selection system 200 used with the present

14   invention is to allow the subscriber to choose a program by touring through a series of

15   menus utilizing a remote control 900 (Figure 3) or similar device providing cursor

16   movement. The final choice in the series of menus will identify one particular channel

17   and one time for activation of that channel. Armed with a channel and activation time,

18   the set top terminal 220 can display the selected program on the television for the viewer.

19   To achieve this goal one embodiment of the present invention assigns an intelligent

20   alpha-numeric code to each program. This alpha-numeric code identifies the category of

21   the program, the menu in which the program should be displayed, its transmission

22   time(s), and the position on the menu that the program should be displayed.

23   In this embodiment, the program control information, including menu codes, is

24   sent continuously from the operations center 202 to the network controller 214, and

25   ultimately to the set top terminal 220. For example, four hours worth of programming

26   information can be sent via the program control information signal continuously using the

27   information shown in Tables A-C.

28   Table A shows the basic programming information that may be sent to the set top

29   terminal 220. The program descriptions shown are coded abbreviations. For example, C

30   for comedy, N for news, S for sports, A for cartoons, and TX for text. If there is a textual

31   description for a program, such as a movie, the description may be given following that

32   program's coded description or may be communicated following the four hours' worth of

33   programming information. As is shown in the coded listing, program descriptions for

1 programs greater than a half hour in length need not be repeated (each half hour). The

2 video description code informs the set top terminal 220 of whether there is still or live

3 video available to advertise the program.

4   For example, a sporting program may be assigned a code of B35-010194-1600-

5 3.25-Michigan St. vs. USC. The letter B would assign the program to category B, sports.

6 The second alpha-numeric character number 3 would assign the program to the third

7 menu of the sports category. The third character of the code, number 5, assigns the

8 program to the fifth program slot on the third menu. The next six characters, 01/01/94,

9 represent the date. The following four characters, 1600 represent the start time which is

10 followed by the length of the program and the program name. This entry represents a

11 sports show, a college football game, which will be aired at 4:00PM on New Years day

12 1994.

13   **TABLE A**

14 **12:00 PM**

	*Program Name	*Program Length	*Menu code	*Description	*Video
1	Cheers	.5	E24	C	N
2	Terminator	2.0	A33	Tx	S
3	Prime Time	1.0	D14	N	N
4	Football Special	.5	B24	S	N
•					
•					
•					
•					

15

16 **12:30 PM**

	*Program Name	*Program length	*Menu code	*Description	*Video
1	Simpsons	.5	E14 & C13	C	S
4	Football Game	3.0	B13	S	N
•					
•					
•					

17   In the 12:30 Channel 1 entry of Table A, two menu codes are shown. By allowing

18 two menu codes, programs that may fit under two different category descriptions may be

1   shown in both menus to the subscriber. With this minimal amount of information being

2   communicated to the set top terminal 220 on a regular basis, the terminal is able to

3   determine the proper menu location for each program and the proper time and channel to

4   activate for the subscriber after his menu selection.

5   Table B shows an example Events Table that may be downloaded to a set top

6   terminal 220 using the Event Data file, which contains information about events and

7   pricing. As shown in the table, the three columns of the Events Table identify the field

8   number, the field itself and the type of information downloaded in the Event Data file.

9   The first column contains the field numbers 1 through 11. The middle column contains

10   the corresponding field parameters, including the event type, event ID, global channel ID,

11   price, start time, end time, start date, end date, P- icon, name and description. The third

12   column contains corresponding field type information. As shown in this field type

13   information typically consists of an unsigned integer; hours, minutes and seconds;

14   months, day and year; and ASCII character identifier.

15   **TABLE B**

Field #	Field	Type
1	Event Type 1= YCTV™ 2= Pay-per-view 3= Reg. TV	Unsigned Int
2	Event ID	Unsigned Int
3	Global Channel ID	Unsigned Int
4	Price (in Cents)	Unsigned Int
5	Start Time	HH:MM:SS
6	End Time	HH:MM:SS
7	Start Date	MM/DD/YY
8	End Date	MM/DD/YY
9	P-Icon	ASCIIZ
10	Name	ASCIIZ
11	Description	ASCIIZ

16   Table C shows an example Event Data file. In particular, Table C shows two data

17   streams corresponding to two event types. The first data stream identifies a YCTV™

1   event in the first field. The second field designates the event ID, which is 1234 in this

2   example. The third field includes the global channel ID number two. The fourth field

3   indicates the cost of 50 cents for this event. The fifth and sixth fields indicate the

4   respective start and end times of 3:00 a.m. to 3:00 p.m., respectively. The seventh and

5   eighth fields show the corresponding start and end date, designated as 8/25/93 and

6   8/27/93, respectively. Field nine indicates the P icon set to PBS.PCX graphics file.

7   Finally, fields ten and eleven indicate the name and description of the event selected,

8   which in this case is <u>Sesame Street</u> and <u>Barney</u>. The second data stream in the Event.Dat

9   example shown in Table C includes analogous information for <u>Terminator IV</u>, which is

10   designated in field one as a pay-per-view event.

11

12   **TABLE C**

13   Event Data Example

1`1234`2`50`03:00:00`15:00:00`08/25/93`08/27/93`pbs.pcx`Sesame Street & Barney's Sesame Street and Barney Abstract
2`1234`2`50`20:00:00`22:00:00`08/25/93`08/25/93`t4.pcx`Terminator 4`Terminator 4 Abstract

14   The program control information signal and STTCIS can be formatted in a variety

15   of ways and the on-screen menus can be produced using different methods. For instance,

16   if the program control information signal carries no menu format information, the menu

17   format for creating the menus can be fixed in ROM at the set top terminal 220. This

18   method allows the program control information signal to carry less information but has

19   the least flexibility since the menu formats cannot be changed without physically

20   swapping the ROM holding the menu format information.

21   In the preferred embodiment, the menu format information is stored at the set top

22   terminal 220 in temporary memory, either in a RAM or EPROM. This configuration

23   provides the desired flexibility in the menu format while still limiting the amount of

24   information needed to be communicated through the program control information signal.

25   New menu format information would be sent using the program control information

26   signal or the STTCIS to the set top terminals 220 each time there was a change to a menu.

1	In the simplest embodiment, the menus remain fixed and only the text changes.

2	Thus, the program control information signal can be limited to primarily text and a text

3	generator can be employed in the set top terminal 220. This simple embodiment keeps

4	the cost of the set top terminal 220 low and limits the bandwidth necessary for the

5	program control information. Another simple embodiment uses a separate channel full-

6	time (large bandwidth) just for the menu information.

7	### 4. Processing the Program Control Information Signal

8	Figures 6a and 6b show a more detailed schematic of the components of the cable

9	headend 208, focusing on the interplay between the network controller 214 and the signal

10	processor's 209 major hardware components. The network controller 214 uses, among

11	other components, the signal processor 209 to implement its monitoring and control

12	capabilities. Although the network controller 214 of the present invention will work with

13	nearly any cable headend signal processing equipment, it is preferred that the signal

14	processing equipment be modern equipment capable of handling digitally compressed

15	video.

16	Figure 6a depicts an embodiment of the basic signal processing capabilities of the

17	cable headend 208 and shows connections to components of the network controller 214.

18	As shown in the figure, RF cable signals 205 are received at the headend 208 through a

19	bank of integrated receiver demodulators (IRDs) 240. Each IRD 240 includes customary

20	RF processing equipment, including a low noise amplifier, a demodulator and other

21	filtering devices (not shown). As each RF feed is fed through the individual IRDs 240,

22	the signals are manipulated and transferred to the demultiplexer and other signal

23	processing equipment for further processing. The demultiplexer 242 splits each cable TV

24	signal into its respective video and audio signal components. In addition, the

25	demultiplexer 242 extracts data from the cable television signals and inputs such data to

26	the control CPU 244.

27	The control CPU 244 exchanges control information with the network controller

28	214, as shown at 211. This control information is exchanged between the signal

29	processor's control CPU 244 and the network controller CPU 224. In particular, the

30	network controller 214 and signal processor 209 pass control information through the

31	interface linking the two CPUs in order to perform any modifications to the program

32	control information signal. The network controller CPU 224 oversees such

1 modifications, accessing various network control databases 226 for guidance in

2 instructing the signal processor's control CPU 244. The instructions provided by the

3 network controller 214 in turn guide the signal processor 209 in combining and/or adding

4 programming signals and advertisements for transmission to the set top terminals 220.

5   The local insertion component 246 of the signal processor 209 allows the control

6 CPU 244 to execute the instructions received from the network controller 214 and insert

7 any local programming and advertisements. Once such regional programming and

8 advertisements have been inserted, the local insertion component 246 passes the various

9 signals to a multiplexer 248 that combines the various programming and advertising

10 signals. The output of the multiplexer 248 is transferred to RF modulator 250 that

11 disseminates the composite video and audio signals to the set top terminals 220. The data

12 extracted from the cable television signals by the demultiplexer 242, which is also sent to

13 the control CPU 244, is transmitted to the set top terminal 220 using a separate RF

14 modulator 252.

15   The network controller 214 accommodates two-way RF data communications

16 with the set top terminals 220. Upstream data transmissions from the set top terminals

17 220 are received by the network controller's control receiver 228. These upstream data

18 transmission capabilities are described in detail below.

19   Figure 6b diagrams another embodiment of a basic cable headend 208 having a

20 network controller 214 and more sophisticated signal processing equipment. Again, RF

21 cable television signals 205 are fed into a bank of IRDs 240 as described above. These

22 signals 205 are demultiplexed into individual video and audio signal components, with

23 data being extracted and sent to the control CPU 244. The individual video and audio

24 signal components are fed into a digital logic circuit 256 that is flexible enough to select

25 individual video and audio signals for repackaging. The network controller 214 oversees

26 such repackaging by: (i) receiving the program control information from the control CPU

27 244, (ii) modifying or manipulating the signal as necessary, and (iii) transferring the

28 modified program control information signal back to the control CPU 244.

29   With instructions from the network controller 214, the control CPU 244 may

30 insert local avails into the digital logic system 256 and execute the various selections of

31 individual video and audio signals for subsequent transmission to the set top terminals

32 220. Once individual video and audio signals have been selected and all local insertions

1   have been made, the outputs of the digital logic circuitry 256 are transferred to a serializer

2   258 which recombines all the signals into a serialized format. The serially-formatted

3   signals are in turn transferred to RF modulators 250 for distribution over the cable

4   network 200. The selection and recombining components of the signal processing

5   equipment are described in greater detail in a co-pending Patent Application, Serial No.

6   08/160,283, now issued Patent No. 5,682,195, entitled DIGITAL CABLE HEADEND

7   FOR CABLE TELEVISION DELIVERY SYSTEM, incorporated herein by reference;

8   however, such sophisticated combining circuitry is not necessary for the operation of the

9   network controller 214. Rather, a simpler signal processing system may readily be used.

10   In the embodiments diagrammed in Figures 6a and 6b, the signal processor 209

11   may, acting alone or in conjunction with control instructions from the network controller

12   214, incorporate local programming and/or local advertisements into the program signals

13   and forward the revised signal to the set top terminals 220. To accommodate this local

14   programming availability, the signal processor 209 must combine the local signal in

15   digital or analog form with the program signals 205 received from operations center 202.

16   If a local cable system 200 uses a compression algorithm or standard that is different than

17   the one used by the operations center 202, the signal processor 209 must also decompress

18   and recompress incoming signals so they may be properly formatted for transmission to

19   the set top terminals 220. In addition, the signal processor 209 performs any necessary

20   signal decryption and/or encryption.

21   Figure 7 diagrams an alternative embodiment of a digital/analog cable headend

22   208. In particular, this embodiment includes decompression and recompression

23   capabilities, showing the types of signal processing components that the network

24   controller 214 may control. As shown in Figure 7, the cable headend 208 receiver front-

25   end, indicated at 260, demodulates the received transponder signals 205, which may

26   contain four, six, eight or more audio/video channels of information, into a digital bit

27   stream of multiplexed digitized MPEG or MPEG 2 format video. The signal processor

28   209 receives the multiplexed signals and initially performs any demultiplexing required to

29   process the received signals. The demultiplexers 242 separate the multiplexed signals

30   into separate individual MPEG or MPEG 2 format digital channels. Depending on the

31   transponder signal received, the demultiplexer 242 may have four, six, eight or more

32   cross connects to the combiner 264. The outputs of the demultiplexers 242 are selectively

1 enabled by the control CPU 244. Those outputs of the multiplexer 248 that are enabled

2 are then input to the combiner.

3 Decrypting may be necessary and can be conducted by a separate decrypting

4 device 262 included as part of the signal processor's internal components. The signal

5 processor's control CPU 244 may be controlled by a remote site (such as a national site)

6 via a modem or similar connection 266. Therefore, the remote site is able to control the

7 output of the demultiplexers 242. Alternatively, instead of enabling the outputs of the

8 demultiplexers 242, the inputs of the combiner 264 may be selected by the control CPU

9 244. By enabling or selecting multiplexer 248 outputs, the control CPU 244 is able to

10 control which television programs are combined and transmitted to the viewers.

11 The combiner 264 combines the enabled or selected outputs of the demultiplexers

12 242 into the proper format and outputs the signals through a compressor 268, and an

13 encryptor 270 (if desired), to a digital modulator 272. The modulator 272 outputs a

14 modulated RF carrier combined with other carriers onto the cable distribution network

15 236. The set top converter terminals 220 in subscribers' homes select and demodulate a

16 particular channel selected by the user. As selections are made, the set top terminal 220

17 stores the programs accessed in its local storage for later transmission to the network

18 controller 214 at the cable headend 208.

19 **5. Changing Menu Content by Modifying the Program Control**

20 **Information Signal**

21 Figures 8a through 8c are sample menu screens produced by a set top terminal 220

22 using the program control information signal. Figure 8a shows a menu which enables the

23 viewer to select a program category from among a choice of eight program categories

24 1048. Figure 8b shows a menu 1050 for the viewer to select a hit movie from among ten

25 hit movies 1052. Figure 8c depicts a menu 1054 which provides information about a

26 movie and enables a viewer to order the movie for viewing.

27 Figures 8a through 8c show text generated by a set top terminal 220. This text is

28 generated using information received via the program control information signal by a text

29 generator (not shown) in the set top terminal unit 220. Those portions of the text that

30 generally remain unchanged for a period of weeks or months may be stored in EEPROM

31 or other local storage. For example, the text "HIT MOVIES from" 1056 will consistently

32 appear on each hit movies' major menu. This text may be stored on EEPROM or other

1   local storage. Further, text such as that which appears at the lower center part of the

2   screen "PRESS HERE TO RETURN TO CABLE TV" 1058 appears many times

3   throughout the menu sequence. This text may also be stored locally at the set top

4   terminal 220.

5   Text which changes on a regular basis, such as the movie titles 1052 (or other

6   program selections), will be transmitted to the set top terminal 220 by either the

7   operations center 202 or the cable headend 208. In this manner, the cable headend 208

8   may change the program selections available on any menu by modifying the program

9   control information signal sent by the operations center 202 and transmitting the change.

10   It is preferred that the text, e.g., 1048, 1052, 1056, etc., be generated by the set top

11   terminal 220 separately from the graphics because the text can be stored locally in a more

12   compact manner requiring less storage space at the set top terminal 220. In addition, it

13   allows for easy communication of text changes from the operations center 202 or cable

14   headend 208 to the set top terminal 220.

15   Figures 8a through 8c show the use of day, date and time information 1060 on

16   menus. This information may be obtained in a variety of ways. The day, date, and time

17   information 1060 may be sent from the operations center 202, the cable headend 208

18   (signal processor 209 or network controller 214), the uplink site 204, or generated by the

19   set top terminal unit 220 internally. Each manner of generating the day, date, and time

20   information 1060 has advantages and disadvantages which may change given the

21   particular embodiment and costs.

22   In the preferred embodiment, the day, date, and time 1060 are generated at a

23   central location such as the operations center 202 and are adjusted for regional changes in

24   time at the cable headend 208. In particular, the network controller 214 modifies the PCI

25   signal to accommodate regional day, date and time information and changes and additions

26   in regional programming and advertisements. These modifications are automatically

27   processed by the network controller CPU 224 upon initiation of the Modifying PCI

28   software routine, as described below. In an alternate embodiment, the network

29   controller's control station operator can manually enter programming, advertising and

30   menu modifications.

31   **6.   Receiving Information from Set top Terminals**

1   The network controller 214 is equipped to receive information from the set top

2   terminals 220 on a regular or random basis. Figures 9a and 9b diagram separate

3   embodiments for upstream data transmission for a digital/analog cable headend 208. In

4   particular, Figure 9a diagrams an out-of-band two-way data transmission system 280

5   wherein satellite feeds 282 are received at the cable headend 208 by a number of satellite

6   receivers 284 and digital signal processing equipment 286. The satellite receivers 284 are

7   used for analog transmissions and the digital signal processing equipment 286 is used to

8   process digital programming signals. The analog signal paths allow analog cable

9   television programming signals to be received by the set of satellite receivers 284 and to

10   be passed to a series of modulators and scramblers 288 the output of the modulators and

11   scramblers 288 is sent to an RF combiner 290.

12   A data transmitter (Data Tx) 292 makes use of the control information transferred

13   to the signal processing equipment from the network controller 214. This data transmitter

14   inserts data into the RF combiner 290. Through the use of a separate data transmitter, any

15   downstream data transmissions may be sent to a set top terminal 220 on an out-of-band

16   frequency (i.e., out of the frequency band used for video signal transmissions).

17   Digital signals are also input to the RF combiner 290 from the digital signal

18   processing equipment 286. These digital signals are typically assigned to separate

19   frequency bands. Once the data, analog and digital signals have been combined using the

20   RF combiner 290, the composite signals are further processed at the cable headend 208

21   for distribution over the cable network. This further processing involves using a diplex

22   filter 294 that accommodates two-way RF communications over the cable distribution

23   network.

24   The diplex filter 294 requires that the various sets of signals be translated to

25   different frequency bands. Typically, services to the home are sent in a downstream

26   band, which begins at 54 MHz and extends today to typically 550 MHz. Other systems

27   that use a maximum frequency less than or greater than 550 MHz, however, may readily

28   be accommodated by the embodiment shown in Figure 9a. Downstream services may

29   include TV channels, FM radio, digital/audio signals and various control and information

30   data streams.

31   Upstream transmissions from the set top terminal 220 are typically sent in the

32   frequency band between 5 and 50 MHz. Other frequency limits may, however, be

1   employed in special cases. For example, the industry is currently experiencing movement

2   toward using 5 to 42 MHz for upstream services.

3   Although the diplex filter 294 is not an inherently bi-directional device, it may be

4   made bi-directional by splitting the spectrum between downstream and upstream signals,

5   as described above. The diplex filter 294 effectively becomes bi-directional by passing

6   high-band signals in the downstream direction and passing low-band signals in the

7   upstream direction. For downstream transmission capability, all signals in the high-band

8   of 50 to 550 MHz are passed to a fiber/coax translation point, indicated generally at 300.

9   At the fiber/coax translation point 300, optical energy is relayed to the various

10   optical nodes 304. This distribution of optical energy typically involves splitting the

11   optical energy among the nodes 304 and transporting the energy downstream on one or

12   more downstream fibers. In addition, electrical energy signals are sent over coaxial

13   cables, through a series of amplifiers 306 along the cable for distribution to individual

14   subscribers. Individual subscribers simply tap into the amplifiers along the coaxial cable

15   in order to receive programming and downstream data signals.

16   Upstream data transmission are sent to the cable headend 208 from each optical

17   node 300 over fiber and input into the cable headend's RF combiner 308. Upstream

18   transmissions over cable are accommodated using carrier frequencies in the lower

19   frequency band. These upstream data transmissions over the coaxial cable are passed

20   through the diplex filter 294, which filters out all high-band frequencies and passes all

21   low-band frequencies. Subsequently, the diplex filter 294 transfers such low-band

22   frequencies to the RF combiner 308. The RF combiner 308 combines all upstream data

23   transmissions from the set top terminals 220 and inputs these combined data signals into

24   the network controller 214 for later processing.

25   Figure 9b shows an alternative embodiment to Figure 9a. In particular, Figure 9b

26   shows the same overall configuration as the embodiment above (and is commonly

27   numbered) although downstream data transmissions from headend 208 to the set top

28   terminals 220 are accomplished through in-band two-way data transmission. Thus, the

29   primary difference between the diagrams shown in Figures 9a and 9b is that the latter

30   embodiment uses a method of inserting data into the downstream programming signals

31   themselves for distribution to the set top terminals 220 in the cable network.

1   Basically, the data placed on the programming signals using a set of data inserters

2 312 that are electrically connected to each modulator and scrambler component 288. In

3 this way, data can be inserted in-band along with video and audio signals, thereby

4 modulating the data on the same respective carrier frequencies used by the video and

5 audio signals. The inserted data is thus combined with video and audio signals and input

6 into the RF combiner 290 for downstream distribution. As described above, digital

7 signals are also combined using the RF combiner 290 and disseminated over the cable

8 network. Upstream transmissions are accomplished as described above in conjunction

9 with the discussion for Figure 9a.

10   Upstream information received from the set top terminals 220 typically includes,

11 for example, program access data gathered at each set top terminal 220. Such information

12 may be communicated to the network controller 214 through a variety of methods

13 including any of the following methods: (1) cyclic polling, (2) random access, and (3)

14 telephone modems. Cyclic polling and random access methods make use of the two-way

15 RF system diagrammed in Figures 9a and 9b, described above.

16   As described below, the preferred embodiment employs a cyclic polling method.

17 Although various polling schemes will work with the present invention, a roll-call polling

18 scheme is preferred over other schemes such as hub polling or token-passing since roll-

19 call polling provides the greatest degree of centralized control.

20   Using this preferred method, program access information is stored at each set top

21 terminal 220 until it is polled by the network controller 214 for information retrieval

22 using a polling request message format 920 as shown in Figure 10a. This frame format

23 920 may include such program control information as shown in Tables A-C above,

24 typically consisting of six fields: (1) a leading flag 922 at the beginning of the message,

25 (2) an address field 924, (3) a subscriber region designation 926, (4) a set top terminal

26 identifier 928 that includes a polling command/response (or P/F) bit 930, (5) an

27 information field 932, and (6) a trailing flag 934 at the end of the message.

28   The eight-bit flag sequence that appears at the beginning and end of a frame, 922

29 and 934, respectively, is used to establish and maintain synchronization. Such a sequence

30 typically consists of a "01111110" bit-stream. The address field 924 designates a 4-bit

31 address for a given set top terminal 220. The subscriber region designation 926 is a 4-bit

32 field that indicates the geographical region in which the subscriber's set top terminal 220

1   is housed. The set top terminal identifier 928 is a 16-bit field that uniquely identifies each

2   set top terminal 220 with a 15-bit designation followed by an appended P/F bit 930.

3   Although field size is provided by this example, a variety of sizes can be used with the

4   present invention.

5   The P/F bit 930 is used to command a polling response from the set top terminal

6   220 addressed, as described below. The frame format 920 also provides a variable-length

7   information field 932 for other data transmissions, such as information on system updates.

8   The frame format 920 ends with an 8-bit flag 934 (or trailing flag) that is identical in

9   format to the leading flag 922 , as set forth above. Other frame formats will be apparent

10   to one skilled in the art and can be easily adapted for use with the system.

11   Using any such polling request message format 920, the network controller 214

12   interrogates each set top terminal 220 sequentially, one by one. In this type of access

13   strategy, the network controller 214 is designated as the central controller of the cable

14   distribution network 200 and is responsible for control of the communications links

15   between itself and the set top terminals 220. This control includes issuing commands to

16   the set top terminals 220 and receiving responses back from the set top terminals 220.

17   Basically, the network controller 214 instructs the signal processor 209 to transmit

18   to each set top terminal 220 a polling request, which asks whether a set top terminal 220

19   has any information to transmit. The set top terminals 220 are identified by the unique

20   address and set top terminal identifier 928. It is preferred that the set top terminal 220

21   transmit information and messages to the network controller 214 only when given

22   permission by the network controller 214 to do so.

23   Where, for example, specialty programs have been accessed since the previous

24   poll, the set top terminal 220 is given permission to transmit a polling response in the

25   form of a status report that includes any such access information. The network

26   controller's control receiver 228 is tasked with the receipt of set top terminal 220 polling

27   responses or status reports. These status reports generally include information that allows

28   the network controller 214 to track a subscriber's program access history. As described

29   above, the control receiver can store the status reports locally and/or transfer them to the

30   network controller CPU 224.

31   The network controller CPU 224 immediately processes each polling response as

32   it is received from each set top terminal 220. The network controller CPU 224 updates

1   pertinent databases 226 with the received information, and then sends another polling

2   request to the next set top terminal 220 on its list.   A set top terminal 220 with no

3   information to transmit so indicates in a reply to the network controller 214. Once all set

4   top terminals 220 have been given permission to transmit status reports, a cycle is

5   complete and a new cycle begins.

6   Through a polling cycle, the network controller 214 acquires the information

7   needed to operate the system 200. During the cycle, the network controller 214 sends

8   signals to the set top terminals 220 to authorize both their operation and access to specific

9   channels. If, for example, a subscriber has failed to pay a recent bill, the network

10   controller 214 can deauthorize the subscriber's set top terminal 220. Likewise, when a

11   subscriber orders a program or channel, the network controller 214 checks the

12   subscriber's account for good standing by reading the proper database file.   After the

13   check, the network controller 214 then either authorizes or deauthorizes access by the set

14   top terminal 220 using the data transmitted in a modified program control information

15   signal. As a result, the cycle requires a series of requests and responses to operate.

16   Figure 10b shows an example frame format 920' for the status reports received

17   from the set top terminals 220 during the polling cycle. This frame format is substantially

18   identical to the polling request message format 920 (Figure 10a), and includes: (1) a

19   leading flag at the beginning of the message, (2) an address field, (3) a subscriber region

20   designation, (4) a set top terminal identifier that includes a polling command/response (or

21   P/F) bit, (5) an information field, and (6) a trailing flag at the end of the message, each

22   designated by a common number with respect to Figure 10a, but with the prime indicator

23   (') added.

24   Again, the information field 932' remains variable in length so that the status of

25   an indeterminate number of programs accessed, as represented at 933', can be included in

26   the frame. In this way, the control message length of the polling request message is

27   minimal since the network controller 214 does not transmit such access information.

28   After a polling response by a given set top terminal 220, however, the control message

29   length increases in proportion to the number of programs accessed.

30   During transmission, the P/F bit 930, 930' is used to carry out the polling

31   function. In particular, the P/F bit 930 is set to a "1" position to command a polling

32   response from the set top terminal 220 whose address is identified in the frame 928. The

1   set top terminal 220 addressed must respond to the command with the same P/F bit 930'

2   also set to the "1" position. The response will include the number of programs accessed

3   and their corresponding event identification numbers as shown in Figure 10b at 933'. In

4   cases where the set top terminal 220 has not accessed any programs since the previous

5   polling cycle, the set top terminal 220 responds with the P/F bit 930' set to "1" and the

6   programs access block denoting zero programs accessed.

7   The second method for the network controller 214 to receive information from the

8   set top terminals 220 is through the use of a random access scheme. In an alternate

9   embodiment that uses this method, individual set top terminals 220 can send control-

10   related messages to the network controller 214 without being polled. This scheme is

11   particularly useful in networks where subscriber regions include potentially large

12   numbers of subscribers. High concentrations of subscribers may be found, for example,

13   in large metropolitan areas. In such cases, the polling cycle can be replaced with a more

14   sophisticated random access strategy such as carrier-sense multiple access with collision

15   detection (CSMA/CD). In this scheme, each set top terminal 220 must "listen" before it

16   transmits and then does so only if it senses an idle medium. When the return link to the

17   network controller 214 is silent, a given set top terminal 220 can transmit its messages.

18   Any messages sent from a set top terminal 220 to the network controller 214 would set

19   the P/F bit 930' to a "0" position to indicate that the message is not in response to any

20   command or polling request. In addition to CSMA/CD, other random access schemes can

21   be used with the system, such as CDSL.

22   The third method for the network controller 214 to receive information from the

23   set top terminals 220 is through the use of telephone modems. In an alternate

24   embodiment, the set top terminals 220 communicate program access information and

25   orders to the network controller 214 using telephone modems. In this embodiment, the

26   set top terminals 220 are equipped with a modem port to facilitate such operation. Thus,

27   communications between a given set top terminal 220 and the network controller 214 can

28   be established over telephone lines when cable traffic or other primary traffic is

29   congested. The preferred method of using telephone modems is in combination with a

30   control or "hit" signal from the network controller 214. A group (or region) of set top

31   terminals 220 is "hit" simultaneously by the network controller 214 via the cable. Only

32   those set top terminals 220 within the group that have data for the network controller 214

1   call the network controller 214 by modem. The network controller 214 is equipped with a

2   bank of modems (organized to roll-over telephone calls) to answer the incoming calls.

3   Among the three methods discussed for the network controller 214 to receive

4   information from the set top terminals 220, the use of the cyclic polling scheme depicted

5   in Figures 10a and 10b, is preferred. Polling is preferred because it allows the network

6   controller 214 to conduct and control communications with set top terminals 220 over the

7   cable network in an orderly fashion. In particular, the network controller 214 can

8   schedule data retrieval by polling the set top terminals 220 one by one. A random access

9   method, on the other hand, does not allow the network controller 214 to maintain such

10   orderly communications. Instead, the network controller 214 receives data from the set

11   top terminals 220 at random, depending on when the cable medium is idle. This random

12   reception of data lessens the degree of control that the network controller 214 has over set

13   top terminal transmissions. Likewise, the third method, which uses telephone modems, is

14   less desirable than the polling method since the use of modems does not allow for

15   upstream interactivity over the cable medium.

16   **7.   Processing Information Received from Set top Terminals**

17   Regardless of the scheme used by the set top terminals 220 to access the network

18   controller 214, any polling responses and upstream interactivity is received by the

19   network controller's control receiver 228 as shown in Figure 11, depicting the

20   components of the control receiver 228, which includes a demodulator 310 and

21   demultiplexer 313 to demodulate and demultiplex transmissions received from any set top

22   terminal 220 in the cable distribution network 200. As described above, the control

23   receiver 228 transfers, through a control buffer 315, the received information to the

24   network controller CPU 224 for processing.

25   Processing is accomplished by the network controller CPU 224. Operator

26   instructions are input to the network controller CPU 224 through the operator control

27   station 234 that includes, for example, a computer/workstation with a CRT display,

28   printer and other peripherals. Multiple operator control stations 234 can be used to assist

29   in control operations.

30   Regional operator control stations (not specifically shown, but substantially

31   identical to stations 234) may be used and may include multiple operator control stations

32   each assigned to a particular subscriber region corresponding to a geographic region

1   where set top terminals 220 are located. Thus, each regional operator control station is

2   assigned to a subscriber region, providing monitoring and control capabilities over such

3   regions. All regional program control information is transferred to the network controller

4   CPU 224 for processing, as in the case where a single control station 234 is used.

5   Likewise, during this processing, portions of the network control databases 226 may also

6   be updated.

7   No set number of databases 226 are required for the network controller 214 to

8   perform its operations, and a single temporary database may be used. In the preferred

9   embodiment, however, the network controller 214 uses several databases (indicated at

10   226) that are accessed during network control operations.   These databases 226 are

11   identified in Figure 11 and include: (1) the Viewer Profile database 314, (2) the

12   Account/Billing database 316, (3) the Program Library database 318, (4) the Program

13   Scheduling database 320, (5) the Advertisement Library database 322, and (6) the

14   Advertisement Scheduling database 324.

15   Figure 12 shows one example of a network controller's basic database structure

16   including the databases identified in the preceding paragraph. The data stored in these

17   databases is not simply raw data. Rather data may be processed, correlated and

18   appropriately indexed to create a true relational database 226.

19   As shown in Figure 12, the Viewer Profile database 314 includes: (i) a Set top ID

20   File, (ii) a Subscriber Region File, (iii) a Customer ID File and (iv) a Viewer Log File, the

21   latter three files being indicated generally as a file group 332. The Set top ID File 330,

22   common to each of the databases comprising the network controller's database 226,

23   contains set top converter records with each record representing a unique set top terminal

24   220. Examples of information stored in this file includes set top terminal type, software

25   version and set top terminal identification/serial number. The Set top ID File 330

26   contains the key data that links each relational database with one another, as described

27   below.

28   The Subscriber Region File, part of file group 332, includes information such as

29   headend 208 assignment, regional operator control workstation assignment and a

30   designation for the subscriber's geographical area. The Customer ID and Viewer Log

31   Files, part of file group 332, include the subscriber's personal information, such as name,

1   address and telephone number, and information on the subscriptions to cable services for

2   each customer as well as a personal profile for each viewer, respectively.

3   The personal profile consists of demographic information that may be gathered in

4   a number of ways. The set top terminal 220 builds the personal profile for each viewer

5   and stores the information in a memory file by viewer name. To build a personal profile

6   in the preferred system, the viewer answers a series of questions presented on a series of

7   menu screens. These personal profile screens request the viewer to input information

8   such as name, sex, age, place of birth, place of lower school education, employment type,

9   level of education, amount of television program viewing per week, and the number of

10   shows in particular categories that the viewer watches in a given week such as, sports,

11   movies, documentaries, sitcoms, etc. Any demographic information which will assist the

12   set top terminal 220 in targeting advertisements to the viewer may be used.

13   In addition to gathering demographics at the set top terminal 220, the personal

14   profile can be compiled using other methods. For instance, the information can be

15   gathered using questionnaires sent by mail and subsequently entered in the Viewer Profile

16   Database 314 by the network controller's control station operator.

17   As an alternative to gathering demographic data, a simulated profile can be

18   generated using an algorithm similar to that described below that analyzes access history

19   and viewing habits. Using test information generated from a statistically significant

20   number of viewers, the simulated profile algorithm estimates the viewer's age, education,

21   sex and other relevant information. The analysis requires reviewing the viewer's

22   programs watched and statistically comparing the viewer's programs watched with the

23   test group. Also, the algorithm can place the subscriber or viewer in a viewer category.

24   This analysis is transparent from the subscriber's point of view and attempts to accurately

25   profile the viewer. Various viewers or viewer categories can later be targeted with

26   different advertisements.

27   The Account/Billing database 316 includes (i) the Set top ID File 330, and (ii) an

28   Account History File, and (iii) a Billing File, the latter two files indicated at 338. The Set

29   top ID File, as described above, contains information unique to each subscriber, including

30   set top terminal type, software version and set top terminal identification/serial number.

31   The Account History and Billing Files contain information concerning each subscriber's

1 past bills and account record and information on the most recent bill, including data from

2 which the next billing report can be generated, respectively.

3   The Program Library database 318 include (i) the Set top ID File 330, and (ii) a

4 Programs File, (iii) a Preview File, (iv) a Program Category File, (v) a Price Category

5 File and (vi) Service File, the latter five files identified at 344. As usual, the Set top ID

6 File identifies each set top terminal 220 by identification number. The Programs File

7 contains information on every program offering in the system, including name, length and

8 type of program. The Preview File contains information on previews for specialty

9 programs stored in the Programs File. The Program Category File contains a set of

10 categories into which each program may be placed, such as movies, sports, science fiction

11 and news. The Price Category File contains information on pricing for various categories

12 of programs, grouping programs and services into categories by price. The Service File

13 maintains information on the various cable services available in the system 200.

14   The Program Scheduling database 320 includes (i) the Set top ID File 330, and (ii)

15 an Access History File, (iii) a Programs Watched Matrices File and (iv) a Program

16 Scheduling Library, the latter three files indicated at 350. The Access History File

17 contains information on the programs that the set top terminal 220 has accessed and the

18 Programs Watched Matrices contains information on the number of programs watched in

19 a given program category during different times of day. Relative to the Programs

20 Watched Matrices file, a programs watched matrix is shown in Fig. 16 and further

21 described below. The Program Scheduling File contains information on the times of day

22 and the corresponding programs that are being offered for viewing at each subscriber

23 location.

24   The Advertisement Library database 322 includes (i) the Set top ID File 330, and

25 (ii) an Advertisements File, and (iii) an Advertisement Category File, the latter two files

26 being indicated at 354. The Advertisements File contains information on every

27 advertisement in the system, including name, length and type of advertisement , and the

28 Advertisement Category File contains a set of categories into which each advertisement

29 can be placed

30   The Advertisement Scheduling database 324 includes (i) the Set top ID File 330,

31 and (ii) an Advertisement Selection File, and (iii) an Advertisement Targeting File, the

32 latter two files identified at 358. The Advertisement Selection File contains information

1 on the advertisements that have been offered to each subscriber and keeps track of the

2 ones that have been selected. The Advertisement Targeting File contains information on

3 the advertisements and advertisement categories that have been chosen by the system as

4 being of the most interest to a specific subscriber..

5   The network control databases 314, 316, 318, 320, 322, 324 comprising the

6 database 226 are relational databases generally keyed to information in a single file.

7 Specifically, the relational key is a set top terminal 220 identification number stored in

8 Set top Terminal ID File 330, as shown in Figure 11. This set top terminal identification

9 number allows the database files that correspond to a particular subscriber to be linked

10 together by a common reference. In other words, the databases are structured such that

11 subscribers are referenced in each database file by a unique set top terminal identification

12 number. In this way, each database may be accessed based on set top terminal

13 identification number alone. Thus, using a subscriber's set top terminal identification

14 number, the network controller CPU 224 can access and process information pertaining to

15 that subscriber from any of the above described database files. In configurations where

16 multiple set top terminals 220 are allocated to a single customer (or household), a unique

17 subscriber identification number may be added to the database 226 to group the set top

18 terminals 220 by customer. With the set top terminal identification as a relational key,

19 many additional databases may be created that correlate and store pieces of subscriber-

20 specific information from the six databases and underlying files.

21   **8.   Overview of Software Routines**

22   Figure 13 shows the major software routines initiated and executed by the network

23 controller CPU 224. These routines are: (1) the Modifying PCI routine 370, (2) the

24 Polling Cycle routine 372, (3) the Advertisement Targeting routine, and (4) the

25 Account/Billing routine 376. Together, these routines, along with the operator entry and

26 update functions 380, 382, respectively, enable the network controller 214 to perform its

27 major functions.

28   The Modifying PCI routine 370 is the software that enables the network controller

29 214 to modify the program control information (PCI) signal received from the signal

30 processor 209. This software routine generally allows the network controller CPU 224 to

31 modify the PCI signal content so that changes and additions in programming and

32 advertisements can be accommodated. Such changes and additions include access

1   authorizations and deauthorizations in the form of authorization and deauthorization

2   messages, respectively.

3   The Polling Cycle routine 372 is the software sequence that interactively executes

4   the network controller's polling cycle allowing the network controller 214 to schedule

5   and perform polling of all set top terminals 220 operating in the system 200. The

6   software also provides the network controller 214 with a means of processing status

7   reports received from set top terminals 220 in response to polling requests. For a random

8   access system (not depicted), the software of this routine 372 would be changed.

9   The Advertisement Targeting routine 374 is the software that generates packages

10   of television commercials and advertisements geared towards particular viewers and

11   makes use of a viewer's demographic information and viewing habits to determine those

12   advertisements that are of most interest to that particular viewer. In so doing, the routine

13   374 outputs packages of advertisements targeted towards each viewer.

14   The Account/Billing routine 376 is the software that the network controller CPU

15   224 runs to generate billing reports for each set top terminal 220. In general, the routine

16   376 correlates the programs accessed with pricing information to generate each report.

17   **9.**   **Modifying PCI Routine**

18   Figure 14 shows a software flow diagram for the network controller's Modifying

19   PCI routine 370. The Modifying PCI routine (or sequence) is initiated, block 384,

20   automatically by the network controller CPU 224 upon receipt of the program control

21   information (PCI) signal from the signal processor 209. Once the network controller 214

22   receives the PCI signal, the network controller CPU 224 begins processing the signal by

23   reading the PCI data carried by the signal, block 386.

24   After reading the PCI data, the network controller CPU 224 "calls" other routines

25   to interactively process data and continue the modification process for each set top

26   terminal 220. First, the network controller CPU 224 calls the Polling Cycle routine 372,

27   at block 388, in order to request data retrieval of the information stored at individual set

28   top terminals 220. Such information includes data on the programs accessed and those

29   ordered for later viewing. As polling responses are received from the set top terminals

30   220, the network controller CPU 224 next calls, block 390, the Advertisement Targeting

31   routine 374, which generally arranges groupings of commercials for different subscribers

32   based, in part, on viewer demographic information and program access history.

1   The network controller CPU 224 next calls 392 the Account/Billing routine to

2   begin processing all programming and channel access requests. The Account/Billing

3   routine determines, among other things, whether the subscriber's account is in good

4   standing, verifying that past bills have been paid and that access authorization is

5   warranted. Upon completion of this verification process, a verification message will be

6   sent to the network controller's operator control station 234 indicating that access should

7   be granted.

8   In the preferred embodiment, an access authorization code may automatically be

9   processed by the network controller CPU 224 and appended to the PCI signal originally

10 received from the signal processor 209. This modified PCI signal and access

11 authorization code will then be transferred back to the signal processor 209 for

12 transmission to the set top terminals 220.

13   With continued reference to Figure 14, in an alternate embodiment that uses the

14 Modifying PCI Routine 370, at blocks 394 and 396, the operator manually enters any

15 changes in programming and menu content, along with access authorizations, into the

16 program scheduling database 320. The manual entry of programming and menu content

17 in this embodiment, blocks 394, 396, requires that the operator access the database

18 information generated and updated by the other routines and make necessary changes in

19 the program scheduling database. The network controller CPU 224 reads this updated

20 database information, generates a modified PCI signal, and sends, block 398, the signal to

21 the signal processor 209.

22   If a subscriber account is delinquent, access to any new programs or channels

23 ordered will not be authorized. Instead, the network controller CPU 224 will deny

24 authorization and generate a deauthorization message to be included in the PCI signal that

25 will be returned to the signal processor 209 for transmission to the set top terminals 220.

26 Alternatively, the network controller CPU 224 generates a delinquency message that is

27 transferred to the CRT display at the network controller's operator control station 234.

28 Upon reviewing the message, the operator may then manually enter message text to be

29 included in the PCI signal that informs the subscriber of a delinquent account.

30   **10.   Polling Cycle Routine**

31   Figure 15 shows a software flow diagram for the network controller's Polling

32 Cycle routine 372, which iteratively executes the network controller's polling cycle. The

49

1   number of iterations correspond to the number of set top terminals 220 being polled. The

2   network controller CPU 224 initiates the Polling Cycle sequence periodically on a

3   predetermined basis, block 400. Typically, this period is set by the operator at the

4   network controller's operator control station 234 at once per day, although other periods

5   (e.g., multiple times per day or once per week) can be used.

6   Upon initiation of the sequence 400, as depicted at function block 402, the

7   network controller CPU 224 reads the Set top Terminal ID File 330 and begins

8   generating, block 404, a polling request frame (shown in Figure 10a and described herein

9   above) for the first set top terminal 220 identified in the file 330. Once the necessary

10   polling request information is complete, the frame is transferred to the signal processor

11   CPU 244 through the interface between the signal processor 209 and network controller

12   214. After transfer to the signal processor 209, the frames may be transmitted to the set

13   top terminals 220, block 406. Meanwhile, the network controller's control receiver 228

14   awaits the corresponding response.

15   Upon receipt of a polling response, as depicted at block 408, the network

16   controller CPU 224 reads the received information from the control buffer 315. The

17   network controller 214 reads the information field of the polling response frame format,

18   as described above. The network controller CPU 224 processes, indexes and stores the

19   data in an appropriate format, updating the corresponding database files with the

20   information received, block 410. The processing and indexing of the raw data into a

21   relational database 226 is important to the ability of the network controller 214 to quickly

22   take actions such as targeting commercials without lengthy processing time. The polling

23   routine subsequently returns to the Set Top Terminal ID File 330, as shown at decision

24   block 412, to continue the polling cycle for the next set top terminal 220 identified in the

25   file 330. When the routine 372 sequences through the last set top terminal 220, the cycle

26   is complete and the routine 372 ceases until the next polling period.

27   Most often, the files that require updates during the polling cycle are the Access

28   History File and the Programs Watched Matrices File, both indicated generally at 350 in

29   Figure 12, and the Account History File 338. For example, Figure 16 shows an example

30   of a 30-day programs watched matrix, denoted 351, for one set top terminal 220 (not

31   shown in Figure 16). The matrix 351 is divided into six rows, corresponding to six four-

32   hour time slots. The columns of the matrix 351 are divided, as necessary, by the program

1   categories available for viewing. Each entry in the matrix 351 denotes the number of

2   programs watched in a particular program category and time period.

3   After the status report is received on each set top terminal 220, the polling

4   response routine (see Figures 10a and 10b) determines which time slot and category of

5   program numbers in the matrix 351 need to be increased. Thus, entries in the matrix 351

6   are updated upon receipt of each set top terminal's polling status report, thereby

7   maintaining a running total of the programs watched. For example, during the 0800-1200

8   time period, the matrix 351 shows that this set top terminal 220 has been used to watch

9   ten movies during the past month. Preferably the program watched identifying

10   information is stored in addition to the running totals in the Programs Watched Matrices

11   file. Use of programs watched matrices is further described in the following section

12   describing the Advertisement Targeting routine.

13   **11.   Basic Advertisement Targeting Routine**

14   Figure 17 shows the seven primary functions of the basic advertisement targeting

15   routine 374. The function of this routine is to target video for set top terminals 220 based

16   on historical viewing data and other data that is available at the network controller 214..

17   Advertisements that may be targeted include video, commercials and infomericals, with

18   infomericals being time varying video segments (e.g., thirty seconds, fifteen minutes).

19   When initiated, block 420, the first subroutine, identified at function block 422,

20   accesses the programs watched matrices (exemplified by matrix 351) stored in the

21   Programs Watched Matrices file in the Program Scheduling database 320. The

22   subroutine uses a unique set top terminal ID to access a specific matrix for one set top

23   terminal 220. These matrices are maintained and updated by the polling response routine.

24   The second subroutine, function block 424, which develops other matrices based

25   on other available information, is an optional subroutine not required for the functioning

26   of the system. For groups of set top terminals 220 or for each individual set top terminal

27   220, matrices may be developed based on the demographic information, billing

28   information, pricing information, age information and other information which may be

29   stored in the network controller 214 databases.

30   The third subroutine, block 426, processes all matrices through a set of correlation

31   algorithms. In particular, this subroutine 426 takes matrices developed in the first two

32   subroutines and processes the matrices until reaching a final matrix.

1   Figure 18 diagrams an embodiment of this matrices processing subroutine 426

2   which is called by the advertisement targeting sequence shown in Figure 17. As shown in

3   Figure 18, the subroutine 426 is initiated 427 and then accesses or queries, block 428, the

4   programs watched file and gathers information regarding either an individual subscriber

5   or a node of subscribers. The software can gather the programs watched information in

6   this way for individual subscribers or a set of subscribers.

7   Once the programs watched information has been gathered from the databases, the

8   routine 426 selects and groups, function block 430, programs watched based on program

9   categories and time slots. The software initially takes each program category (e.g., sports,

10   news, movies, etc.) and establishes the number of programs watched for a given time slot.

11   The time slots may be set to any length of time, including, for example, one, two, three or

12   four hour timeframes. The software will loop through such a counting process for each

13   group and timeslot and then proceed to build a programs watched matrix, block 432,

14   based on the program categories and time slots. Essentially, all programs watched in a

15   particular category and time slot will be entered into the programs watched matrix. Once

16   the matrix has been built, the subroutine 426 will process the matrix for a given

17   subscriber or node of subscribers through the correlation algorithms.

18   A number of correlation algorithms may be used to weight each selected program

19   category group. For example, as shown at block 434, a sum of squares algorithm may be

20   used to determine the weighting. Once the groups have been weighted, the weighted

21   groups will be correlated, as at block 436, with various advertisements stored in the

22   network control databases. The software can then select a set of the most heavily

23   weighted advertisements for transmission to individual subscribers or sets of subscribers

24   in a cable distribution network node. Having determined the weightings of each group

25   and prioritizing the groups accordingly, the subroutine returns 438 to the advertisement

26   targeting sequence 374 of Figure 17.

27   Referring back to Figure 17, the fourth subroutine, as represented at function

28   block 428, uses the final matrix developed by the correlation and weighing algorithm

29   described above, to select a grouping (or selective filter) for each set top terminal 220.

30   The final groupings of advertisement that may be sent to the set top terminals 220 or node

31   of set top terminals 220 may use a subroutine as diagramed in Figure 19.

1   The subroutine 428 depicted in Figure 19 is called or initiated by the

2   advertisement targeting sequence 374 of Figure 17 in order to determine the final

3   groupings. Basically, this subroutine selects a set of commercials that will be used in the

4   chosen groupings, function block 444. This selection process typically involves

5   advertisements from various advertisement categories (from a number of advertisers

6   which have purchased "air time"). Each advertisement will subsequently be assigned a

7   number of times that it will be shown in a given timeframe, block 446. This frequency of

8   display may be based on various factors, including the number of requests and cost paid

9   by the respective advertisers to have the commercial displayed. Such factors are used in

10   the next step of the subroutine, block 448, which assigns a weighting to specific

11   commercials or advertisements in each advertisement category or group. These

12   weightings are used to prioritize the advertisements that will be sent to individual set top

13   terminals 220 or nodes of set top terminals 220.

14   Once the advertisements have been weighted, the software executes its correlation

15   algorithm, 450, using selected criteria (i.e., the various factors used to weight the

16   advertisements) as well as the output of each programs watched matrix. Any number of

17   correlation algorithms and weighting algorithms may be used with the software, including

18   the sum of squares weighting algorithm described above.

19   The results from the correlation algorithm subsequently determine the

20   advertisements and programming material that is sent to the signal processor 209 for

21   distribution over the cable network, as represented at block 452. Once the subroutine 428

22   completes these steps, the network controller CPU 224 updates the account and billing

23   database based on the ads that are sent to the signal processor 209 for subscriber viewing,

24   as shown at block 454. These billing database updates allow the advertisers to track the

25   costs and frequency of the advertisements targeted to specific set top terminals 220 or

26   nodes of set top terminals 220. Following the updates, the subroutine returns to the

27   advertisement targeting sequence shown in Figure 17, block 456.

28   Referring to Figure 20a, set top groupings (A through E) 460 are shown. The

29   number of set top groupings available is determined by the bandwidth available to

30   transmit commercials. The bandwidth of the system will limit the number of

31   commercials which are available at the set top terminal 220 at any given time.

1   Referring back to Figure 17, the fifth subroutine, represented at function block

2   466, prepares set top group information for transmission to the set top terminals 220.

3   This subroutine 466 modifies the PCI signal and includes set top group information in the

4   information field of the frame format given earlier. The various methods for transmitting

5   the group information to the set top terminals 220 are described below.

6   The sixth subroutine, block 468, selects the target video and is the last decision

7   making process in targeting a commercial for a viewer and, can be performed by either

8   the set top terminal 220 or the network controller 214. In the preferred embodiment, the

9   set top terminal 220 performs this last step by correlating (or matching) the program

10   being watched by the viewer with the set top group information that has been previously

11   transmitted by the network controller 214, and the targeted video is then displayed, as

12   shown at block 470. Figure 20a shows an exemplary table matching set top terminal

13   groups 460 and program category being watched 470 with a specific channel

14   (continuously) showing commercials. The commercial channels are shown in Figure 20b

15   at 474 and are assigned Roman numerals I through X, for example. The number of set

16   top groupings and channels showing commercials can vary. Figure 20b shows a division

17   of available bandwidth to carry ten videos, ten commercial channels. In this example, the

18   channels 474 are numbered 101-110.

19   The network controller 214 will transmit group information to a set top terminal

20   shown as row names 460 on Figure 20a. The network controller 214 will also transmit

21   data which informs the set top terminal 220 which of the multiple commercial channels

22   474 is assigned to a television program category shown as Columns 470 on Figure 20a.

23   Each set top terminal 220 only requires the data related to that set top terminal's assigned

24   group (or row). For example, in Figure 20a, the set top terminal in group A (row A) is

25   provided with data on the commercial channel which are assigned for sports programs as

26   I, children's programs as IV and movie category as III. In this manner, each set top

27   terminal 220 is only required to store information related to its own grouping. Therefore,

28   a set top terminal 220 which is in group A only needs to store the information related to

29   group A, which is found in row A of Fig. 20a. This information includes one commercial

30   channel assignment for each of the eight program categories. Using this information, the

31   set top terminal 220 first determines the category of the television program currently

32   being watched and then is able to quickly determine which channel to switch the viewer

33   when an advertisement availability occurs during the program.

1   The network controller 214 can also perform the step of correlating program
2   category watched 470 and set top terminal grouping 460 to select the target video. In
3   order for the network controller 214 to perform this function, it must have information on
4   the program currently being watched by the viewer. To obtain this information in a
5   polling system, set top polling must occur on a real-time basis (i.e., 10 minutes).

6   During the target commercial selection process, the set top terminal programming
7   will default to the existing commercial during a program if it is missing any of the
8   information needed to determine which of the continuously playing commercial channels
9   to show. In alternative embodiments, the default that is shown on the regular
10   programming channel will correlate with one of the assigned set top groupings and
11   program categories. Figure 20a shows, at 478, that the default has been assigned to set
12   top terminal grouping C for program categories "children" and "entertainment."

13   The three preferred methods to transmit targeted commercials to a set top terminal
14   220 are: (1) the Additional Bandwidth method (or individual video access); (2) the
15   Multiple Channel method, and (3) the Split Screen method. Each method has certain
16   advantages and disadvantages. The Additional Bandwidth method allows the most
17   flexibility by more specifically targeting commercials before the commercials are
18   transmitted to a set top terminal 220. However, it requires a great deal of available
19   bandwidth in the delivery system. This is difficult with a cable system 200 but possible
20   when a telephone or personal communications system is used to transmit the commercials
21   to the set top terminal 220.

22   The Additional Bandwidth method allows the network controller 214 to run
23   through a set top terminal's specific correlation algorithms and target specific
24   commercials from hundreds for each set top terminal 220. This method allows for the
25   greatest customizing of targeting and allows for a greater selection of commercials to be
26   shown. Only after a commercial advertisement is selected by the network controller 214
27   for the specific set top terminal 220 does transmission of the commercial occur.

28   The Multiple Channel method requires a set top terminal 220 "transparently" to
29   change channels during a scheduled advertisement from the channel of the currently
30   viewed program to the channel which is carrying the targeted commercial. Although this
31   channel changing method may be transparent to the viewer, it creates difficulty in terms
32   of timing and synchronizing the commercials to begin and end during an advertisement

1 availability occurring in the normally scheduled program. The channel changing is done

2 within the set top terminal 220 using the existing tuner(s). The hardware required to

3 accommodate such transparent channel switching capabilities are shown in Figures 24a,

4 and 24b. Figure 24a shows the set top terminal hardware components which

5 accommodate channel switching within a single 6 MHz channel bandwidth. These

6 components include a tuner 603, a demodulator 606, a demultiplexer 609, a multiplexer

7 604, a decompressor 622, a microprocessor 602, and local memory M. The tuner 603

8 operates by tuning to a specific 6 MHz bandwidth which includes the displayed video and

9 a number of channels carrying advertisements. The demodulator 606 processes these

10 signals and sends them to the demultiplexor 609, which converts the received signal into

11 separate program and advertisement signals. During this processing, the microprocessor

12 602 coordinates the demultiplexing of the programming signals. Once the video signal

13 pauses for a commercial break, the microprocessor 602 instructs the multiplexer 604 to

14 select the advertisement or advertisements for decompression and subsequent display on

15 the subscriber's television. This hardware configuration allows the set top terminal 220

16 to switch between channels within the 6 MHz bandwidth and display various

17 advertisements for viewing, regardless of the video currently being watched by the

18 subscriber.

19   Where a targeted advertisement falls outside the tuned 6 MHz bandwidth

20 containing the video that the subscriber is currently watching, the hardware configuration

21 shown in Figure 24b is used. In this configuration, the microprocessor 602 instructs the

22 tuner 603 to return to another 6 MHz channel bandwidth, as represented by bi-directional

23 arrow A.

24   Working together, the microprocessor 602 and tuner 603 allow targeted

25 advertisements, which have been transmitted in another 6 MHz bandwidth, to be tuned

26 with minimal acquisition time and delay. In particular, this configuration allows the set

27 top terminal 220 to tune outside a given 6 MHz bandwidth (to another 6 MHz bandwidth)

28 in order to select a targeted advertisement for display. This alternative embodiment may

29 require the use of a full screen mask in order to minimize any annoying screen rolling

30 during the tuning process. The masking is intended to cover any glitches which would

31 otherwise be displayed during the acquisition time (e.g., 0.5 seconds) for returning to

32 another 6 MHz channel bandwidth.

1   Where the acquisition time or delay becomes unreasonable, an alternative

2   embodiment can include the use of two tuners similar to the configuration shown in

3   Figure 24c. This alternative configuration using two tuners, trades an increased cost for

4   lower acquisition times. In set top terminals 220 equipped with two tuners, the terminal

5   can use the second tuner to tune the channel showing the commercial. (Set top terminals

6   with two tuners are described in detail in co-pending patent application, Serial No.

7   08/160,194, now issued Patent No. 5,990,927, entitled, ADVANCED SET TOP

8   TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, incorporated herein

9   by reference. Again, the channel changing is transparent to the viewer who believes the

10   same channel is continuously being shown. The Multiple Channel method has the

11   disadvantage of requiring that sufficient additional channels be available (by less

12   bandwidth than Available Bandwidth method). Those skilled in the art will recognize a

13   number of other configurations of set top terminal hardware that will accommodate a

14   transparent channel switching feature.

15   The Split Screen method transmits multiple commercials on a single channel

16   using a split screen technique; commercials being pre-recorded and prepared prior to

17   transmitting to the set top terminal 220. Although many commercials can be transmitted

18   on a single channel, in the preferred form of the split screen method, only four

19   commercials are shown. As the number of commercials increases the size and the

20   amount of video information transmitted for each commercial decreases proportionately

21   (i.e., 6, 8, 12, etc.). Using split screen methodology, either a masking technique or a

22   scaling and repositioning of video technique must be used at the set top terminal 220 to

23   show the ad. The masking and repositioning-scaling techniques are further defined in co-

24   pending application Ser. No. 08/160,193, now issued Patent No. 5,734,853, entitled, SET

25   TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, owned by the

26   assignee of the present invention and incorporated herein by reference. The scaling and

27   repositioning technique produces better quality commercials, but requires expensive

28   equipment at the set top terminal 220. The set top terminal 220 will perform audio

29   switching with the split screen method to amplify the correct audio.

30   **12.   Alternatives to Basic Advertisement Targeting Routine**

31   Figure 21 shows a software program flow 490 that is an alternative to the network

32   controller's Basic Advertisement Targeting routine 374, depicted in Figure 17. The

33   alternative program 490 allows each set top terminal 220 to be individually targeted with

1   specific advertisements and is initiated automatically, block 492, by the network

2   controller CPU 224 upon receipt of each polling response from a set top terminal 220.

3   Thus, once the network controller 214 receives program access information from a set top

4   terminal 220, the network controller CPU 224 begins the process of selecting a package

5   of advertisements that is based on, among other things, that subscriber's demographic

6   information and viewing history.

7   Upon receipt of a polling response from a set top terminal 220, the network

8   controller CPU 224 reads the set top terminal identifier, 494, and the programs accessed,

9   496, from the polling response (or status report) (depicted in Figure 10b). The network

10   controller 214 writes information on the programs accessed to the Program Scheduling

11   database 320, updating the Access History File which contains listings of all programs

12   accessed within the past week, month or year.

13   With continued reference to Figure 21, the network controller CPU 224 then calls

14   a subroutine that sorts the programs accessed by program category, block 498. In turn,

15   the program categories are sorted, 500, based on the number of times that programs

16   appearing in each particular category are accessed. In so doing, this sorting subroutine

17   determines and ranks those programs and program categories that are most frequently

18   viewed by that set top terminal 220.

19   The subroutine can iteratively produce rankings for different time slots in a given

20   day. In this way, different rankings can accommodate different viewing preferences

21   during those time slots for a single set top terminal 220. For example, where rankings for

22   eight three-hour time slots are desired, the subroutine determines a ranking of programs

23   and program categories for each three-hour viewing period. Thus, a different ranking

24   may be produced, for instance, for a morning time slot and an evening time slot.   All

25   rankings of programs and program categories for that set top terminal 220 are written to

26   the Viewer Profile database 314, updating the Viewer Log File, as at function block 502.

27   Next, the network controller CPU 224 calls a subroutine that correlates the

28   updated Viewer Log File with the Advertisement Categories File in the Advertisement

29   Library database 322, block 504. By correlating these two files with one another, the

30   subroutine assigns or correlates various categories of television commercials to each

31   ranking of programs and program categories in the Viewer Log File. The categories of

32   television commercials and advertisements that may be so assigned are found in the

1   Advertisement Categories File indicated generally at 354 as part of the library 322 and

2   may include: (1) Household Goods/Products, (2) Home Improvement and Maintenance,

3   (3) Personal Hygiene, (4) Entertainment Items and Events, (5) Sporting Goods and

4   Events, (6) Motor Vehicles and Related Products, (7) Foodstuffs and Beverages, and

5   (8) Miscellaneous. Where, for example, the viewer has watched a sporting event, the

6   Sporting Goods and Events, Home Improvement and Maintenance, and Foodstuffs and

7   Beverages categories may be assigned to that particular sporting event/program and

8   Sports program category.

9   Once the programs and program categories ranked in the Viewer Log File are

10   correlated with the advertisement categories in the Advertisement Categories File, the

11   routine calls a sorting subroutine that ranks the groups of advertising categories correlated

12   based on other information in the database files. In the preferred system, this ranking is

13   primarily based on data in the updated Access History File and the updated Viewer Log

14   File, as shown at function block 506. By using data on the viewer's past program

15   selections and demographic information, the subroutine ranks the correlated categories of

16   advertisements according to those likely to be of most interest to that viewer.

17   After the advertisement categories have been sorted and ranked, the routine selects

18   the top three advertisement categories as the targeted categories for a given time slot and

19   viewer, block 508. Individual advertisements are then chosen from the Advertisements

20   File, with all selections made from the targeted categories, 510. The advertisements that

21   are selected are written to the Advertisement Targeting File from where advertising

22   packages can be generated, function 512, for transmission to the set top terminal 220.

23   Such packages are generated by the network controller CPU 224, which accesses the

24   Advertisement Targeting File and includes the targeted advertisements in the PCI signal.

25   The entire routine is repeated for each set top terminal 220 and, alternatively, each

26   viewer.

27   **13.   Account/Billing Routine**

28   Figure 22 shows a software flow diagram for the network controller's

29   Account/Billing routine 376, initiated automatically at block 520 by the network

30   controller CPU 224 upon receipt of each polling response from a set top terminal 220.

31   Upon receipt of such a response, the network controller CPU 224 identifies the set top

32   terminal identifier from the polling response, block 522. The program access block in the

1   polling response is also read, function 524, and the Access History File is updated with

2   the received information, function 526. The routine then calls a subroutine that correlates

3   the updated information in the Access History File with the Price Category File in the

4   Program Library database, block 528. Once all programs accessed since the last polling

5   cycle are assigned to a price category, the pricing information from each category is

6   written to the Account History File, updating the file at 530. The network controller CPU

7   224 generates a billing report for each set top terminal 220 based on the updated account

8   history, function 532. This billing report can be sent to the set top terminals 220 in a

9   polling request. Specifically, in one embodiment, the information field of the frame

10 format described in Figure 9a is used to provide the set top terminal 220 with billing

11 information.

12   Account information for each set top terminal 220 can be viewed through a

13 monthly account review menu. The account information necessary to create the monthly

14 account review menus may be stored either in the memory of the set top terminal 220 or

15 at a remote location that communicates with the set top terminal 220. In the simplest

16 embodiment, the set top terminal 220 records a subscriber's selections locally and

17 calculates the monthly account review based upon the subscriber's selections which

18 require the payment of fees. This monthly account information is stored locally and sent

19 to the network controller 214 upon polling.

20   The Account/Billing routine is capable of processing account and billing

21 information generated in other embodiments. For example, in an alternate embodiment,

22 the subscriber's viewing selections and billing information may be continuously

23 maintained at the network controller 214 or a remote site connected via communication

24 lines to the cable headend 208. The network controller 214 or the remote site must

25 regularly transmit the monthly account information to the set top terminal 220.

26   Each embodiment, such as local billing storage at the set top terminal 220, billing

27 by the network controller 214 or billing by a remote site, has advantages and

28 disadvantages. If the account information and processing is done locally at the set top

29 terminal 220, each set top terminal 220 must be provided with the memory and necessary

30 processing capability to maintain the account. This greatly increases the cost of a set top

31 terminal 220. If the account information is maintained remotely, the remote site must

32 remain in regular contact with the set top terminal 220 in order to provide the subscriber

33 with billing information. To accommodate homes with multiple viewers two or more set

1 top terminals 220 may be placed on a single bill or two accounts may be created for one

2 set top terminal 220.

3   Figure 23 shows another embodiment in which billing may be accomplished

4 through the use of remote statistical and billing sites (SBS). In this arrangement,

5 statistical and billing information from individual communities of set top terminals 1750

6 is communicated through cable headend sites to regional statistical and billing sites 1730

7 (SBS). A regional SBS may serve several cable headend sites, shown at 1732. The

8 regional SBS 1730 calculates billing and statistical information and passes necessary

9 billing information back downstream through the network controller 214 at the cable

10 headend 208 to an appropriate single set top terminal 220 in a subscriber's home. In

11 addition, the regional SBS 1730 communicates the billing and statistical information

12 received on program viewer choices to the central SBS 1740.

13   The central SBS 1740 accumulates the data received from a number of regional

14 statistical and billing sites and calculates national statistical and billing information. In

15 the preferred embodiment, the regional SBS 1730 prints and mails bills to subscribers.

16 The central SBS 1740 can calculate program ratings, shares and HUTS (homes using

17 televisions) for the nation and by region. With information from interactive TV

18 programs, sophisticated statistical information may be gathered through the network

19 controllers of the cable headends.

20   This arrangement for billing and statistical information provides the operators of

21 the system with the advantages of distributive processing.

22   Remote billing sites may serve regions of the country by having each cable

23 headend 208 in a region of the country connected to one regional billing site. The

24 information from the regional billing sites may then be communicated on a less frequent

25 basis to the operations center 202 or a central billing location. This method of distributed

26 processing of billing enables the central billing location to receive fewer communications

27 and be more efficient. In addition, the communication links between the cable headend's

28 network controller 214 and regional sites will be of shorter distance than communication

29 links to the operations center 202 from the cable headends 208. This should result in a

30 cost savings to the system operator.

31   Regional statistical and billing may, however, be eliminated and all

32 communications from the cable headend 208 may proceed to the Central SBS 1740. In

1 fact, the Central SBS 1740 can be collocated with the operations center 202 and all

2 functions performed at one central location. If the cable program packaging and delivery

3 system 202 is established in just one locale, the network controller 214 can perform all

4 the statistical and billing procedures.

5 ### C. Targeted Advertising Using Menu System

6 ### C.1. Menu Structure

7 Figure 25 shows a series of menus having a normal or standard format for a

8 variety of alternative embodiments of the invention. An Introductory menu screen 1000

9 that is displayed upon power up, and that contains important messages, followed by a

10 Home menu 1010 with major programming categories is the basis upon which many

11 alternative embodiments of the menu driven selection process can be built.

12 Skipping a sequence or level of the menu structure is possible and perhaps desired

13 in certain instances. In simple alternate embodiments it is possible to combine the Home

14 menu 1010 and the Introductory menu 1000 into one menu that performs both functions.

15 It will be obvious to one skilled in the art that the specific functions of the Home menu

16 1010 and the Introductory menu 1000 may be exchanged or shared in a number of ways.

17 It is also possible to allow a user to skip directly from the Introductory menu 1000 to a

18 submenu 1050. This can be accomplished most easily with a separate direct access

19 remote control 900 button. Generally, a user will access a television program through

20 execution of a submenu 1050.

21 The During program menus 1200 are enacted by the set top terminal 220 only

22 after the user has selected a television program. These menus provide the user with

23 additional functionality and/or additional information while he is viewing a selected

24 program. The During program menus 1200 sequence can be further subdivided into at

25 least two types of menus, Hidden Menus 1380 and Program Overlay Menus 1390.

26 To avoid disturbing a user during viewing of a program, the Hidden Menus 1380

27 are not shown to the user but instead "reside" at the set top terminal 220 microprocessor.

28 The Hidden Menus 1380 do not effect the selected program audio. The microprocessor

29 awaits a button entry either from the remote control 900 or the set top terminal 220

30 buttons before executing or displaying any Hidden Menu options. The Hidden Menus

31 1380 provide the user with additional functions such as entering an interactive mode or

32 escaping from a selected program.

1   Program Overlay Menus 1390 are similar to Hidden Menus 1380 in that they

2   occur during a program. However, the Program Overlay Menus 1390 are overlayed onto

3   portions of the television screen and not hidden. The Program Overlay Menus 1390

4   allow the user to continue to watch the selected television program with audio but place

5   additional information on portions of the television screen. Most overlays cover small

6   portions of the screen allowing the user to continue to comfortably view the program

7   selection. Other Overlays that are by their nature more important than the program being

8   viewed will overlay onto greater portions of the screen. In an embodiment, some

9   Program Overlay Menus 1390 reduce or scale down the entire program video screen and

10   redirect the video to a portion of the screen.

11   Figure 26 shows an embodiment for user selection of television programming.

12   The Introductory menu 1000 followed by the Home menu 1010 is the preferred sequence

13   of on-screen displays. In the embodiment shown in 26, the Home menu 1010 provides a

14   choice of ten major menus 1022, 1024, 1026, 1028, 1030, 1032, 1034, 1036, 1038 and

15   1040. Upon selection of a major menu 1020 from the Home menu 1010, the program

16   proceeds to the major menu 1020 offering further viewer selections. Each major menu

17   1020 may be customized to target the expected viewership. Depending on the number of

18   available program choices, the major menus 1020 either breakdown the major category

19   into sub-categories or provide the user with access to further information on a particular

20   program.

21   For example, the major menu 1024 for children's programming provides a list of

22   subcategories 1053 from which the user selects. Upon selection of a subcategory, a

23   submenu 1054, 1055 listing program choices within that sub-category is shown to the

24   user. Upon selection of a particular programming choice within the submenu 1055, the

25   user is then provided with a second submenu 1059 describing the program that the user

26   has selected. From this menu, the user may now confirm the program choice and receive

27   a confirmation submenu 1061 from the set top terminal 220 software.

28   Since the system utilizes digital signals in compressed format, High Definition

29   Television programming can also be accommodated through the menu system. In

30   addition, since the set top terminal 220 has two way communication with the cable

31   headend, interactive television programming is possible, with return signals generated by

32   the set top terminal 220. Similarly, the system can support "movies on demand" where a

1 user communicates through the set top terminal 220 with an automated facility to order
2 movies stored at the facility.

3   Using this on-screen menu approach to program selection, there is nearly an
4 unlimited number of menus that can be shown to the user. The memory capability of the
5 set top terminal 220 and the quantity of information that is sent via the program control
6 information signal are the only limits on the number of menus and amount of information
7 that can be displayed to the user. The approach of using a series of menus in a simple tree
8 sequence is both easy for the user to use and simply implemented by the set top terminal
9 220 and the remote control 900 with cursor movement. A user interface software
10 programmer will find many obvious variations from the preferred embodiment shown.

11   Figures 27a and 27b show examples of Introductory menu screens that are
12 displayed on the user's television. The embodiment shown in Figure 27a welcomes the
13 user to the cable system and offers the user three options, for example. The user may
14 choose regular cable television (channels 2 through 39), videos on demand (e.g., movies),
15 or instructions on the use of the remote control 900. Other basic program options are
16 possible on the Introductory menu screen 1000. For example, instead of, or in addition
17 to, the remote control 900 instructions, a system "help" feature can be offered on the
18 Introductory menu 1000.

19   Fig 27b shows an alternate embodiment for the Introductory menu screen 1000.
20 In the upper left-hand corner of the menu, is a small window 1002 that may be
21 customized to the user. The user may be given the option of showing the current time in
22 this window. In the upper right-hand corner a second customized window 1004 is
23 available in which the user may show the day and date. The windows 1002 and 1004
24 may also be customized for users to show military time, European date, phase of the
25 moon, quote of the day, or other informational messages, including promotionals,
26 infomercials and advertisements. The windows 1002 and 1004 may be customized by
27 users using on-screen menu displays following the Introductory menu 1000, or
28 informational messages may be provided by a remote site such as the operations center
29 202.

30   In an embodiment, the user is given the capability of accessing basic channels
31 such as regular broadcast television and standard cable television channels directly from
32 the Introductory menu 1000 by entering the channel number. The user is also given the

1   capability of directly accessing his account with the cable television company. Further, in

2   the embodiment, the user may directly access a major menu 1020 and bypass the Home

3   menu 1010. If the user is familiar with the programming choices available on the major

4   menus 1020, he may select an icon button, or a lettered key (alpha key) from the remote

5   control 900 and directly access the desired major menu 1020. If any key entry other than

6   those expected by the set top terminal 220 software program is made, the Home menu

7   1010 is placed on the television screen. If, after a period of time, no selections are made

8   from the Introductory menu 1000, the program may default to the Home menu 1010.

9   Figures 28a, 28b, 28c, and 28d are examples of Home menus 1010 that may be

10   used in the set top terminal 220 software. Figures 28a-28d all employ multiple window

11   techniques to make the menu user friendly and offer a significant number of choices. A

12   channel line up and the major menus 1020 may both appear on the Home menu 1010.

13   In Figure 28a, the Home menu 1010 displays both the standard channel line up

14   and the video on demand icons for selection by the user. Figure 28a also shows various

15   levels of subscription programming, including a "Basic"cable package and a "Basic Plus"

16   package. Each of the choices of subscription programming preferably is assigned a

17   different color. This increases the user friendliness of the present invention.

18   In Figures 28b-28d, the left half of the screen is used to list the channel number

19   and network abbreviation of the most popularly watched networks. The right half of the

20   screen offers access to a variety of major menus 1020 listed by category names.

21   Figure 28b shows an embodiment in which only eight major menus 1020 are

22   utilized. By pressing the alpha-numeric or icon key corresponding to the category of

23   programs the user desires, the appropriate major menu 1020 is accessed. In addition, the

24   user may employ an on-screen cursor to select any option shown in the menu. To move

25   the cursor, the user may use either the cursor movement keys on the remote control 900

26   or similar keys located at the top of the set top terminal 220.

27   Figure 28c shows how additional major menus 1020 can be displayed on the

28   Home menu 1010. When there is no longer room available for additional major menu

29   1020 choices on the Home menu 1010, the user may access a second screen of the Home

30   menu 1010. For example, in Figure 28c, if additional major menus 1020 "J" through "Z"

31   existed, the user would access those menus by highlighting and selecting the J through Z

32   menu option (or press the buttons J-Z on the remote control 900). After selecting J

1 through Z, the second or extended Home menu 1010 would appear on the user's

2 television set. This menu would then list options J through Z separately by name. The

3 Home menu 1010 may have many extended Home menu screens. However, any more

4 than a few extended Home menu screens may confuse the average user.

5   The Home menu 1010 of Figure 28d adds an additional feature at the bottom of

6 the television screen 1011. This option allows the user to see only those program

7 selections that are available on broadcast television. Figures 28a-28d are but a few of the

8 numerous variations available for the Home menu 1010.

9   Additionally, as shown in Figure 29, in an alternate embodiment, the Home menu

10 1010 (or menu which would normally follow the Introductory menu 1000) can be simply

11 the standard cable channel line-up. Offering the standard cable line-up on a separate

12 menu may make selection easier for users with small television screens.

13   Figures 30a and 30b are examples of major menus 1020. In particular, Figures

14 30a and 30b show a major menu 1040 whose category is hit movies.

15   The hit movie category is a list of recently released movies which have been

16 found to be popular among movie goers. This movie list may be changed once or twice a

17 week to keep in line with new movie releases. Again, multi-window and customized

18 window techniques are utilized to make the menu as user friendly as possible.

19   Figure 30a shows an embodiment of the hit movies menu 1040. The hit movies

20 menu icon along with the hit movies category letter A are displayed. The current date

21 and time are displayed at the top of the screen over a menu background. Ten movie

22 selections are displayed in the center of the screen 1009, each in a box that may be

23 highlighted when selected. In the lower left part of the screen, a logo window 1512 is

24 available as well as two other option choices 1011, Movie Library and Return to Cable

25 TV. In an alternate embodiment, the return to Cable TV option is changed to return to the

26 Home menu 1010 (or return to other viewing choices).

27   In Figure 30b, the left upper window 1002 displays current time and the right

28 upper window 1004 displays a message. This menu provides a list of eight movie titles

29 and their rating. A user who desires further information on any particular movie may

30 select the movie using the cursor movement buttons and press the "go" button on the

31 remote control 900 or set top terminal 220.

1   In the major menu 1020 example of Figure 30b, the customized windows 1002

2   and 1004 in the upper corners may remain constant from menu to menu. The name of the

3   menu and category are at the top and center of the menu screen 1039. To make the menu

4   aesthetically pleasing, the instructions are given across the center of the screen and

5   choices in large legible type are provided. Additionally, at the bottom of most menu

6   screens 1011, the user is given the option of returning to regular TV or returning to the

7   Home menu 1010.

8   Figures 30c-30g show alternative embodiments of major menus 1020 for the

9   Home menu 1010 shown in Figure 28a. Figures 30c-30g show various major menus

10 directed to the type of subscription services available (basic service 1420, basic plus

11 1422, economy package 1424, ala carte and premium channels 1426). These menus also

12 provide promotional or advertising information, the cost for the particular subscription

13 service, or other video inserted by the operations center 202, the cable headend 208, or

14 the set top terminal 220, for example. Figure 30g shows a major menu for the Learning

15 Channel 1428, one of the individual channels shown in the Home menu of Figure 28a.

16   The above menus may be grouped in similar colors or shades of colors. For

17 example, the basic subscription service could have a light pink color. As the subscription

18 services increase in terms of the number of channels available, the color shading may

19 increase correspondingly. Therefore, the premium subscription service (ala carte service)

20 would have a dark red color, contrasting with the light pink color of the basic subscription

21 service.

22   In Figure 30b, the movie titled <u>Terminator 4</u> is highlighted, signifying that the

23 user has chosen this program option from the hit movie major menu. Figure 31 shows a

24 submenu 1050 which would follow the selection of <u>Terminator 4</u> on the hit movie major

25 menu. In Figure 31a, the banner across the top of the screen 1502 remains constant from

26 major menu 1020 to program description submenu 1050. For the comfort of the user, the

27 left upper window 1002 remains the same and shows the current time. The upper right-

28 hand corner 1004 carries a message stating the next start time for the movie selected.

29   **C.2. <u>Notification</u>**

30   Figures 32a and 32b are notification submenus informing the user that a program

31 selection is about to begin (e.g., counting down until start time). Using these submenus,

32 the set top terminal 220 warns the user prior to switching away from the program being

1   viewed to a prior selected program. These notification submenus are provided to the user

2   approximately one or more minutes before the set top terminal 220 changes the viewing

3   channel.

4   Both notification submenu 1127 examples allow the user to cancel the program

5   order. In Figure 32a, the user is notified in the center of the screen that the chosen

6   program may be canceled within the first five minutes. In Figure 32b the user may press

7   escape to cancel the order without charge. The notification submenu 1127 of Figure 32b

8   informs the user of the start time at the upper portion 1103 of the screen.

9   The notification submenu of Figure 32b is an example of a simple three-window

10   menu. A strip window at the top of the screen 1103 notifies the user of the program

11   selected and the amount of time before the program begins. The center window is a large

12   video window 1556 for displaying the program. At the bottom of the screen the submenu

13   carries another strip menu 1105 that informs the user to escape from the program

14   selection without charge by pressing escape.

15   Using a notification submenu 1127 may allow the operations center 202 or the

16   cable headend 208 to display other videos for the user to view until the start time of the

17   chosen program. The other videos include short video clips from the chosen program,

18   promotionals, infomercials and advertising. The promotionals, infomercials and

19   advertising may be targeted to the individual set top terminal 220 described previously in

20   section B, Network Controller Description. The other videos may be displayed on the

21   entire display, or a portion of the display, as previously described.

22   **C.3. <u>Promotion</u>**

23   As noted above, the menu system generated by the operations center 202 may be

24   used for promotions. For example, Figures 33a and 33b relate to promotion of HDTV.

25   Figure 33a is an example of a menu 1032 advertising a new feature of the system.

26   Promotional menus, such as Figure 33a, may be dispersed throughout the menu driven

27   program selection system. This particular menu describes the HDTV feature and explains

28   its unavailability until a future date. Figure 33b shows the integration of HDTV services

29   into the menu driven program delivery system. The user who selects the major menu for

30   HDTV receives a description of the service with a suggestion to order the system, or a

31   text note that the user is a current user and a listing of the currently available program

32   selections in HDTV as shown in a second screen 1232. A user who has not paid to join

1   the particular service, HDTV, may be allowed to join one of the programs in progress for

2   a limited time as a demo to entice the user to order. The user who has paid the HDTV

3   fees proceeds as the user would in any other major menu screen.

4   This particular major menu shows an example of how a follow-on or second

5   screen may exist for the same menu. In this case, a second screen exists for the major

6   menu HDTV 1032. The user may access the second screen 1232 by selecting the last

7   menu display block in the lower part of the screen "Other HDTV Selections". Following

8   this selection, the user is given the second screen 1232 of program selections. In this

9   manner, any menu can have multiple screens with many program choices. This type of

10   screen pagination on one menu allows the packager to avoid categorizing program

11   selections within that same menu. In an alternative embodiment, the options available to

12   the user may be scrolled on one menu screen with the text within the menu display blocks

13   changing as the user scrolls up or scrolls down.

14   Figures 34a, 34b, and 34c demonstrate the use of promotional menus to sell

15   subscriptions to services in the system. In particular, Figure 34a is a promotional menu

16   1304 for Level A interactive services. Level A interactive services offers users

17   additional information about programs such as quizzes, geographical facts, etc. This

18   information may be received by the set top terminal 220 in several data formats including

19   the vertical blanking interval and in the program control information signal. Figure 34b is

20   a promotional menu 1306 for Level B interactive services which include a variety of on-

21   line type services such as America-On-Line, Yellow Pages, Airline Reservations, etc.

22   Figure 34c is a promotion menu 1308 for the Level C interactive services. The

23   Level C interactive services utilize local storage such as CD technology to offer an

24   enormous range of multi-media experiences. The Level C interactive services require a

25   hardware upgrade as described earlier. Specially adopted CD-I and CD-ROM units are

26   needed for this service.

27   **C.4. <u>Interactive Services</u>**

28   Figures 35a through 35e show menus that are available using the interactive Level

29   A services. When interactive Levels A services are available in a television program, the

30   system may display the interactive logo consisting of the letter "I" and two arrows with

31   semicircular tails, for example. In an embodiment, the set top terminal 220 will place the

32   interactive logo on the television screen as an overlay menu 1310. In the embodiment,

1   the set top terminal 220 will detect that there is data or information available about a

2   television program that can be displayed to a user using the interactive service. When the

3   set top terminal 220 senses that interactive information is available, it will generate the

4   interactive logo overlay menu and place it on the television screen. For example, the set

5   top terminal 220 may detect that information on a television program is being sent in the

6   vertical blanking interval and will generate an interactive logo overlay menu. The

7   interactive logo overlay menu may appear on the user's television screen for

8   approximately fifteen seconds during each ten minute interval of programming, for

9   example.

10   The user who sees the interactive logo on his television screen is made aware of

11   the fact that interactive services are available in conjunction with the program. If the user

12   presses an interactive remote control button, an additional overlay menu will be generated

13   by the set top terminal 220 and placed on the screen. This menu 1310 is shown in Figure

14   35a being overlayed on an interactive television program. From this menu the user may

15   select interactive features or return to the television program without interactive features.

16   The user who selects interactive features is presented with the interactive Level A

17   submenu 1312 in Figure 35b. From this submenu the user may choose a variety of

18   different types of textual interactivity with the current program or a related video. Some

19   examples are quizzes, fast facts, more info, where in the world, products, and

20   advertisements for products. At any time during the interactive submenus the user may

21   return to the current program without interactive features.

22   This interactive submenu has an example of taking a complete television program

23   video, scaling it down to a smaller size and directing the video into a video window of a

24   submenu.

25   Figure 35c shows an interactive fast facts submenu 1314. In this submenu textual

26   information is given to the user in the lower half of his screen. This textual information

27   will change as additional data is received by the set top terminal 220 relating to this

28   television program. The textual information may relate to a promotion or may advertise a

29   product or service.

30   Figure 35d shows the use of the subcategory "more information" in the interactive

31   service. This submenu 1316 gives additional information related to the television

32   program to the viewer in textual form in the lower half of the screen. Figure 35e is an

1 interactive submenu 1318 for the subcategory "quiz." In this interactive subcategory, the

2 user is presented with questions and a series of possible answers. If desired, the user

3 selects one of the answers to the quiz question. After the selection, the set top terminal

4 220 sequences to the interactive quiz answers submenu which informs the user whether

5 the correct answer was chosen.

6 ### C.5. On-Line Connections

7 Figure 36a is an example of a submenu for Level B interactive services. From this

8 menu screen 1330, any of a number of on-line data services could be accessed, including

9 access to Internet service providers such as America-On-Line. In Figure 36a, the airline

10 reservations selection has been selected by the user.

11 Figures 36b through 36e provide an example of a sequence of menus that a user

12 may encounter with an on-line data service. The example relates to airline information

13 and reservations and the user in this sequence is reserving and purchasing airline tickets.

14 Figure 36b is an example of the first submenu 1332 for a data service offering various

15 options. In this case, the user has the option of checking current reservations or making

16 new reservations. In each of these submenus related to a data service, the user is able to

17 return to the Home menu 1010 or regular cable television and exit the data service.

18 Figure 36c, an airline information and reservation submenu 1346, allows the user

19 to choose a one-way or round-trip ticket and to confirm his reservations. The user who .

20 desires to proceed may charge the airline ticket to a credit card by choosing the

21 appropriate strip menu on the lower part of the screen.

22 Figure 36d, an airline information and reservation submenu 1348, is an example

23 of how credit card purchases may be made using the on-line data services. In this menu

24 1348, the user charges a round-trip plane ticket on a credit card. The user simply needs to

25 enter the credit card number, expiration date, and credit card type to charge the airline

26 ticket.

27 Figure 36e, an airline information and reservation submenu 1350, is an example of

28 a menu that may be shown whenever an on-line data service is processing a request sent

29 by the user. In this menu 1350, the on-line data service is processing the user's credit

30 card charge for his airline ticket.

31 ### C.6. Digital/Audio Program Choices

1   Figure 37a is a major menu 1038 displaying the digital/audio program choices that

2   are available for users who have paid the monthly fee. In a chart format, the major menu

3   shows the top five, top ten, and top forty songs available in six different categories of

4   music. Below the chart, the system is able to provide a text message describing the

5   particulars of the audio program selected.

6   The digital/audio feature of the invention allows a user to listen to CD quality

7   audio selections through his stereo. This can be accomplished by running cables directly

8   from the set top terminal 220 to the user's amplifier/stereo system. Alternatively, the user

9   may listen to audio selections through the television.

10   Figures 37b and 37c are promotional menus 1400, 1404 for the digital/audio

11   feature. Using the same logos and menu format, the system can provide a text description

12   enticing the user to pay the monthly fee and join the service. In Figure 37b, the menu

13   allows the user to test the system with a free demonstration. The menu in Figure 37c

14   allows the user to request additional promotional information about the system. Both

15   Figures 37b and 37c are representative of promotional menus that may be used

16   throughout the menu system.

17   The terms and descriptions used herein are set forth by way of illustration only

18   and are not meant as limitations. Those skilled in the art will recognize that numerous

19   variations are possible within the spirit and scope of the invention as defined in the

20   following claims.